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NINTH

BIENNIAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF IOWA

FOR THE

FISCAL PERIOD ENDING JUNE 30, 1897.

DES MOINES:
F. R. CONAWAY, STATE PRINTER.
1897.

STATE OF IOWA,
OFFICE OF SECRETARY, STATE BOARD OF HEALTH,
DES MOINES, July 1, 1897.

To Francis M Drake, Governor of Iowa:

SIR—In accordance with the provisions of section 11, chapter 151, laws of Eighteenth General Assembly, the Ninth Biennial Report of the State Board of Health, for the fiscal period ending June 30, 1897, is herewith presented.

J. F. KENNEDY, M. D.,
Secretary.

MEMBERS OF THE BOARD.

	TERM EXPIRES.
E. H. CARTER, M. D., Des Moines (Eclectic)	January 31, 1898
J. M. EMMERT, M. D., Atlantic (Regular)	January 31, 1899
R. E. CONNIFF, M. D., Sioux City (Regular)	January 31, 1900
J. A. SCROGGS, M. D., Keokuk (Regular)	January 31, 1901
JOHN C. SHRADER, M. D., Iowa City (Regular)	January 31, 1902
W. BANCROFT, M. D. (Homeopathic)	January 31, 1903
E. A. GUILBERT, M. D., Dubuque (Homeopathic)	January 31, 1904
WARREN DICKINSON, Civil Engineer, Des Moines	August 19, 1901
MILTON REMLEY, Attorney-General, *ex-officio.*	
JAMES I. GIBSON, D. V. S., Denison, State Veterinary Surgeon, *ex-officio.*	

PUBLIC HEALTH LAW.

CHAPTER 16.—TITLE 12.—CODE.

Membership of State Board.

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 therefor to be provided by the custodian of the capitol. At the meetings 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.

Meetings.

Election of officers.

Powers of State Board.

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.

Rules to be enforced by local boards

Duties of State Board.

Biennial Report.

Assessors to take births and deaths.

SEC. 2566. It shall be the duty of all assessors at the time of making assessments to obtain and report to the clerk of the district court upon blanks adopted by the State Board of Health, and furnished by said auditor, such registration of births and deaths as occur within their respective districts for the year ending December 31st, immediately preceding.

Must report to county clerk.

County clerk must keep record of registration.

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 with such data respecting the same as shall be required by the State Board of Health, and he 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 three, 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.

County clerk, report to State Board.

Local boards, Membership of.

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 the termination of the cause for quarantine as the case may be.

Clerk of.

Health officer.

Powers and duties of.

Burial.

Nuisances.

Rabid animals.

Quarantine.

Nuisance—notice to be given.

Nuisance abated at owner's expense.

Quarantine by mayor or township clerk.

May enter buildings.

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.

Complaint to magistrate.

Execution of warrant.

Nuisance removed at owner's expense.

Contagious disease, Care of the sick.

SEC. 2570. When any person shall be infected, or shall have been recently infected, or sick with small-pox 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.

Expense of quarantine; how paid.

Removal of the sick.

Local boards; meetings of.

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

Regulations of. Notice given.

Must report to State Board.

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.

Expenses of local boards —how paid.

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.

Must enforce rules of State 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, any one 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.

Regulations. Penalty for violations of.

Penalty—recovery of.

Exposure to infection. Penalty.

SEC. 2574. The Secretary of the State Board of Health shall receive such salary as the State Board shall fix, not to exceed twelve hundred dollars 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.

State Board. Compensation. Salaries.

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.

State Board. Appropriation for.

INSPECTION OF PETROLEUM PRODUCTS.

CHAPTER 11, TITLE 12.—CODE.

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.

SEC. 2504. The State Board of Health shall make rules and regulations for the inspection of petroleum products, for the government of inspectors, and prescribe the instruments and apparatus to be used. Such rules and 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 filled 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 product, 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 thoroughly 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 at a specific gravity of not less than seventy nor more than seventy-five degrees when used in the Welsbach hydro-carbon incandescent lamp, and for street light by street lamps; 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 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 imprisoned 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 period 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.

TO PROHIBIT THE USE OF IMPURE OIL IN COAL MINES.

CHAPTER 9, TITLE 12.—CODE.

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 this State.

SEC. 2494. Any person, firm or corporation, either by themselves, agents or employés, selling or offering to sell for illuminating purposes in any mine in this State, any adulterated or impure, 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 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 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 the State Mine Inspector, whenever he has reason to believe that oil is being used, or sold, or offered for sale in violation of the provisions of this chapter, to take samples of the same and have them tested or analyzed, and if they are found to be impure he shall make complaint to the county attorney of the county wherein the offense is committed, who shall forthwith commence proceedings against the offender in any court of competent jurisdiction. All reasonable expenses incurred in testing or analyzing oil under the provisions of this section, shall be paid by the owner of the oil whenever it shall be found that he is selling or offering to sell impure oil in violation of the provisions of this chapter. Such costs may be recovered in a civil action, and in criminal prosecutions under this act such expense shall be taxed as part of the costs.

SEC. 2496. The provisions of this chapter shall apply only to coal mines.

PREFATORY.

The statute creating the State Board of Health makes it the duty of the Secretary of the Board, in the biennial report to the Governor, to "include so much of the proceedings of the Board, such information concerning vital statistics, such knowledge respecting diseases, and such instruction on the subject of hygiene as may be thought useful by the Board, for dissemination among the people, with such sugges ions as to the legislative action as they may deem necessary."

In compiling this Ninth Biennial Report I have endeavored strictly to conform to the statutory requirement. A glance at the table of contents, but especially a careful perusal of the subjects considered, will show that nearly every phase of sanitary knowledge has been practically exploited.

Attention has been called to the various infectious diseases, the causes producing them and the best methods of prevention; to the means by which these diseases are spread; to the similarity of certain diseases of animals to diseases affecting the human family; to the responsibility of physicians respecting the spread of diseases; to hygiene in the public schools, and the relation of the physician to such schools; to veterinary science and its relation to the public health; to the care of the insane, and the dangers of substituting county care for State care in such cases; to food poisoning; to river pollution; to diseases of animals, etc.

There are extended and important articles upon milk; flour —white vs. dark, or whole wheat, flour; and upon formaldehyde, the new disinfectant.

The articles presented in the report represent the best and latest thought of the Board, and of sanitarians generally, upon the subjects presented; and if they were read by the people of the State, duly considered and the practical suggestions heeded,

the State would be amply reimbursed for any outlay of money connected with the maintenance of the State and local boards of health.

The attention of the legislature is especially invited to "Legislative Suggestions," found on page 346. The suggestions made are highly important to the interests of efficiency, economy and uniformity.

Grateful acknowledgment is hereby made to Mr. L. F. ANDREWS for valuable assistance in the preparation and publication of this report.

J. F. KENNEDY,
Secretary.

September 15, 1897.

CONTENTS.

MEETINGS OF THE BOARD.

AUGUST MEETING, 1895.

Pursuant to adjournment the Board convened at the capitol, August 1, 1895. There were present Drs. Guilbert, Scroggs, Becker, Emmert, Carter and Shrader, Prof. M. Stalker, State Veterinary Surgeon, and Warren Dickinson, civil engineer.

The quarterly report of the Secretary was read and referred to the standing committees.

UNWHOLESOME MEAT.

The following communication was presented to the Board and referred to a special committee.

SIOUX CITY, Iowa, July 2, 1895.

J. F. Kennedy, Secretary, Des Moines, Iowa:

DEAR SIR—Has the State Board of Health ever taken any action in regard to the wholesomeness or unwholesomeness of the flesh of pregnant cows and other neat animals?

The Bureau of Animal Industry has formulated rules for its inspectors at the abbattoirs, among which is one directing them to condemn all cows over eight months advanced in pregnancy and sows over fourteen weeks.

This worked all right as long as they required the packers to tank all condemned animals, but they issued a rule that went into effect the 1st, whereby the packer can sell all such animals within the State where his plant is located, so that the State wherein a plant is located, virtually becomes the dumping ground for diseased and unwholesome meat from the surrounding States. For illustration: Yesterday, at one of the packing plants of this city a cow was slaughtered that was over eight months advanced in pregnancy. The carcass was condemned by the government inspector and stamped with U. S. condemnation tags, but the packer, instead of sending it to the tank, as was formerly done, sold it to a local butcher. Now the question arises, is there any law or ruling of the State Board of Health that would justify me, as city meat inspector of this city, in condemning and destroying said carcass?

If there is any authority for the condemnation of such meats I would gladly cause its destruction, but at the present time our city attorney is unable to give me light on the subject.

An early reply will greatly oblige.

Respectfully yours,
G. A. JOHNSON,
City Veterinarian.

The committee to whom the communication was referred reported the following rule and recommended its adoption, and it was adopted:

"We recommend placing the limit of pregnancy after which the carcass may not be used for food at seven months for cows, and ten weeks for sows."

TRANSPORTATION OF CATTLE.

Professor Stalker recommended that certain regulations for the transportation of cattle adopted by the Board December 28, 1894, be rescinded, as the statute relating to the State Veterinary Surgeon covers the points regulated thereby. The recommendation was adopted. The regulations rescinded are as follows:

RULE 1. All neat cattle that have been reared, or kept south of the parallel forming the north boundary of Indian Territory, or thirty-seven degrees north latitude, and have not subsequently been kept continuously at least one Winter north of said parallel, and which may be brought within the limits of this State between the first day of April and the first day of November following, except for transportation through the State on railways or boats, shall be subject to quarantine; and all land on which such cattle may have been kept or fed, within the State, shall in like manner be subject to quarantine.

RULE 2. All cattle, as defined in Rule 1, while in transit through this State, which may be removed from any car or boat, within this State, for the purpose of feeding, watering, re-shipment, or other cause whatsoever, shall be confined in yards, stables, or enclosures, separate and apart from all other animals, and no other cattle shall be permitted to come within such yards, stables, or enclosures, or in contact with such quarantined and enclosed cattle.

RULE 3. Between the first day of April and the first day of November following, no cattle whatsoever, except such as are defined in Rule 1, shall be placed within any stable, yard, or other enclosure where cattle have been quarantined under Rule 1, unless such yards, stables, and enclosures have been previously thoroughly cleansed and disinfected.

TUBERCULOSIS AMONG CATTLE.

Professor Stalker reported verbally the progress made at the State College respecting the transmissibility of tuberculosis by heredity, and by the use of milk from tuberculous cows. Though only partially completed, the experiments have determined two facts:

1. Healthy calves taken from non-tuberculous cows, as determined by the tuberculin test, and fed exclusively upon milk from tuberculous cows, became tuberculous.

2. Calves taken from tuberculous cows, as shown by the tuberculin test, and fed on milk from non-tuberculous cows, showed no signs of tuberculosis.

In both experiments the calves were killed when three months old.

The experiments tend to show that milk from tuberculous cows produce the disease, and that tuberculosis is not hereditary.

CIGARETTES.

Dr. Emmert presented a brief paper upon cigarettes, their source, use, and baneful effects, which was accepted, and ordered printed. It will be found in another place in this report.

SMALL-POX.

July 26th a case of small-pox was officially reported about two miles north of Linn Grove, in Douglas township, Clay county. The subject was a male adult who had been exposed to the disease at Etnaville, Ohio, and was said to have been in quarantine. When discovered the disease was in the papular stage. Rigid restrictive measures—isolation, quarantine, and vaccination—were promptly resorted to, enforced and maintained.

PUBLIC WATER SUPPLIES.

A paper from Prof. Floyd Davis on public water supplies was read and referred to the committee. It will be found in another place in this report.

MILK INVESTIGATION.

Prof. J. C. Bay presented a paper upon bacteriological investigations of milk to detect the presence or absence of the tubercle bacillus, to-wit:

To the Iowa State Board of Health:

GENTLEMEN—Immediately after the last meeting of the Board, the State Dairy Commissioner proposed an investigation of the commercial milk at such cities and towns in the State as are under his jurisdiction. The principal object of this examination was to ascertain to what extent the dairy products of this State were contaminated with the generators of tuberculosis.

On other occasions I have laid before you facts in regard to the status of these questions. I am glad to be able to report on original investigations, although it is true that the present ones are not yet completed; but in spite of the necessarily fragmentary nature of this report, I have reached conclusions which may be used in future work. What this report may contain of interest or importance is due to the efficient and intelligent action of the Dairy Commissioner.

For some time complaints appear to have been made at Ottumwa to the effect that the milk supply was not as exemplary as desired. Several samples of commercial milk were found to contain pus, or thus suspected. The health officer, Doctor Baker, had examined various samples and had found

pus. Three samples of milk of the infected supply were given me by the Dairy Commissioner, and submitted for examination.

In this instance, as with a few exceptions, in all others, the milk, when received at the Dairy Commissioner's office, was properly marked, and placed for a period of five minutes in the centrifugal machine employed in the Babcock method of butter-fat testing. In recent works of similar kind, such as that of Dr. E. C. Schroeder, of the Bureau of Animal Industry[1] this method has been uniformly employed. The purpose of submitting the milk to centrifugal forces is to collect all sediment and solid matter at the bottom of the glass. It has been demonstrated by Scheurlen[2] that the tubercle bacilli, if dispersed in milk, will be collected at the bottom of the glass, if the milk is rotated in the manner already mentioned, while other bacteria will show the directly opposite, namely, the centripetal tendency.

The three samples received, as mentioned, were examined, and one of them, representing the bottom layer of the milk rotated, was found contaminated with tubercle bacilli and pus.

The milk so contaminated came from the supply of a certain milk dealer. Through the local milk inspector, samples were taken from the individual cows in the herd furnishing the supply. Twenty-two samples were received and numbered, by the milk inspector, from 1 to 22 inclusive; of these, numbers 1, 3, 4, 6, 7 and 10 were contaminated with tubercle bacilli. In no instance the infection was surprisingly great, but so far as I am able to judge, in the absence of facilities for making inoculations upon guinea-pigs, the numbers contained in each of these samples would be able to cause infection, if they should be able to reach such places in the animal system as would be susceptible to their infective and destructive powers.

The results of my study were promptly reported to the milk inspector, with orders to prevent the sale of milk from the six cows whose milk had made a positive response to the test. At the same time the inspector was notified to inspect the dairy and subject the six cows to a minute examination. The inspector promptly paid the required visit and reported as follows: "These cows have been kept continually in the barn for the last five years. Four years ago last February he had a cow in this same end of the barn die of what appeared to them consumption, but they knew nothing of the nature of the disease and paid no attention to it. A year later the cow that stood by her side died in a similar way, but since then they have not lost any; but every one of the cows (whose milk is) now pronounced infected with tubercle bacilli has stood ever since in this same row, and all the other cows in the barn are free."

The appearance of cow No. 1 was thus reported:

"I did discover in this cow, on the inner side of front teat, an indication of a small lump, but manipulation dissipated it. I discovered this when I took samples also."

All the other cows appeared to have healthy looking udders and appeared to be in average good health.

I was, from the beginning of these examinations, perfectly well aware, that examinations of cow's milk for tubercle bacilli were in no way a sure

[1] Investigation concerning bovine tuberculosis, Bull. No. 1, Bureau of Animal Industry U. S. Dep. of Agriculture, p. 75. Washington, 1894.

[2] Arb. a. d. Kais. Gesundheitsamte. VII 289, 1891.

criterion with regard to the distribution of tuberculosis in cattle. The two principal questions around which I am trying to gather explanatory facts, are:

First.—How far the commercial and other dairy milk is contaminated with tubercle bacilli, and

Second.—Under what conditions tubercle bacilli, and probably their toxic products, are found in cow's milk.

Some of the problems involved in these questions cannot be solved unless a small number of infected cows could be studied, and be under close observation for some time. I am thinking, now, especially of the second question. It has been repeatedly stated by Bang, Ernst, Peters, Kellogg and others, that tubercle bacilli may occur in the milk at different periods. Nobody has, so far as I have become aware, studied the conditions or laws governing the presence, or the absence of the bacilli in the milk. It is also an open question if tuberculin will be found in the milk of tuberculous animals at all times. Kellogg[1] states that the bacilli may be distributed throughout the body of diseased animals by the blood vessels, but has not proved this by a single observation. But, as it is true, that the milk of tuberculous cows is more infectious at certain times than at other times, and that the bacilli are found in the milk to-day, but probably not to-morrow, and as this disease is governed, as all other infectious processes, by natural laws, observations and experiments must be able to show under just what conditions the milk is contaminated.

In this regard—the question being one of much importance to both producers and consumers—the authoritative statement of Peters: "That animals with only slightly diseased mediastinal glands are of no immediate danger to other cattle or to the public health," is noteworthy. I believe, however, that intracorporal infection is not so much dependent—this is in contradiction to Kellogg's views—upon the blood vessels as upon the lymphatic system. Should this be true, infection of the mediastinal glands may be more dangerous than it is considered by Peters. The fact that apparently healthy cows make a positive response to the tuberculin test, and that post-mortems, in many instances, show diseased mediastinal and other lymphatic glands might indicate that the lymphatic system is a pre-eminent factor in intracorporal infection.

I have examined, so far, five hundred and sixty-three samples of milk. Of these, three hundred and fifty-nine were from individual cows, and two hundred and four from herds; that is, composite samples.

The samples were taken in forty or one hundred cubic centimeter bottles, and each bottle was at once marked by the inspector, in such a way that the cow from which it came might be at any time recognized.

First, the inspector took samples from the milk cans belonging to the different dairymen at the place. If any of these samples were found to be contaminated, the herd, or rather, the milk, was kept in quarantine until the individual cows of the same herd had had their milk examined. Those whose milk gave positive response to the test were ordered removed and their milk prohibited from the market.

Of the two hundred and four composite samples, four, that is, about two per cent., were contaminated; and of the three hundred and fifty-nine

[1] Tuberculosis, 1895, p. 5.

samples from individuals, fifty-one were contaminated, that is 14 5/6 per cent.

Should I venture to deduct any results from the facts now recorded, I should emphatically say that bacteriological analyses of milk are not sure.

Prof. E. W. Rockwood, was elected Chemist of the Board until the May meeting.

Prof. Stalker, the Secretary, Dr. Carter, and Mr. Dickinson were appointed to represent the Board at the meeting of the United States Veterinary Association to be held in Des Moines.

NOVEMBER MEETING, 1895.

At the meeting held November 7th, there were present Drs. Guilbert, Carter, Emmert, Conniff, and Becker, Prof. M. Stalker, D. V. S., and Warren Dickinson, C. E.

The Secretary's report for the quarter ending October 31st, was read and referred to the standing committees.

FOOD POISONING.

An extensive and remarkable instance of food poisoning at a wedding feast at Sabula, Jackson county, in September, was reported verbally by the President, Dr. Guilbert, to whom the subject had been referred for investigation as to the cause. He said:

"The Sabula epidemic, from the long and cautious examination made by the State Board's representative, had its origin in the poisoned food taken at the famous wedding by the persons affected. It is in evidence that only those were affected who were at the wedding and ate of the food provided. The disease thus developed presented marked resemblances to typhoid fever, and the post-mortems that were made showed the peculiar abdominal lesions of this disease.

"The evidence, in view of the facts in the case, as we are at present advised, is that the epidemic aforesaid was one of typhoid fever, produced by poisoned food.

"No trichinæ have been found in any of the four examinations made by different experts.

"The poisoned food referred to hereinbefore was unquestionably the chicken."

QUARANTINE EXPENSES.

The Secretary reported a communication from the mayor of the town of Blencoe, in which information was sought as to whether or not the county was liable for expenses of quarantine established and maintained by a mayor in accordance with regulations of the State Board of Health, the local board having neglected or refused to adopt any regulations relating thereto, and where the sick are unable to pay such expense.

The following reply was made thereto, with the concurrence of the Attorney-General:

"The statute, section 16, laws of 1880, chapter 151, as amended by chapter 59, laws of 1892, provides that local boards of health shall make such regulations regarding cause of sickness and quarantine, not in conflict with the regulations made by the State Board of Health, as may be necessary for the public health and safety.

"Sections 21 and 22, *ibid.*, provide that local boards shall provide proper care, food, nurses, medical attendance, etc., for the sick.

"Section 1, *ibid.*, provides that the State Board of Health shall have charge of all matters relating to quarantine, and shall make such rules and regulations as may be necessary for the protection or improvement of the public health, and that it shall be the duty of all officers of the State to enforce such regulations.

"Section 16 also requires the mayor of a city, upon written notice given that any contagious disease exists at any place within his jurisdiction, to forthwith quarantine the same as may be required by the State Board of Health.

"The theory, intent and purpose of the statute is that quarantine of contagious diseases shall be under the immediate control and direction of local boards of health. It requires them to make the necessary regulations therefor. It is mandatory. For neglect or refusal to do so they are unquestionably liable for malfeasance as public officers.

"It is not to be presumed that the object and purpose of the statute shall fail because of the laches of a local board. In fact, it provides for such an emergency when it declares that the mayor of a city shall establish and maintain quarantine in accordance with regulations made by the State Board of Health.

"It is fair to presume the legislative mind had this in view in 1892, when substituting section sixteen for that in the original chapter, which gave no such power or authority to the mayor.

"There can probably be no question as to the liability of the county for expenses of quarantine of contagious diseases and the proper care of the sick incurred by the mayor of a city under regulations made by the State Board of Health, in the absence of regulations made by the local board of health of the city of which he is mayor."

SMALL-POX.

Dr. Nordstrum made a final report of cases of small-pox in Clay county. There were four in all, one fatal, a babe, with lung complications.

One case of small-pox was reported from Dubuque in the person of an employé on a ferryboat. He was at once removed to the pest house, and there were no more cases.

STILL-BIRTHS.

The Board was asked for a definite declaration as to what period of utero-gestation a loss of the fœtus should be reported as a "still-birth."

On motion of Dr. Emmert it was decided that the earliest period for reporting a still-birth should not be prior to the seventh month of *utero-gestation*. For the purposes of vital statistics, as contemplated by the statutes, births prior to that period need not be reported at all.

PERSONAL.

Professor Stalker presented the following, which was unanimously adopted:

WHEREAS, The term of office of Dr. Frederick Becker as a member of the State Board of Health is about to expire, we deem it a privilege to express our appreciation of his services.

Resolved, That it is the expression of the Board that in the services of our colleague, Dr. Becker, we have found invaluable help in the work of this body, and the interests of the State have been most faithfully and efficiently served.

Resolved, That we extend to Dr. Becker a cordial expression of our confidence in his ability as a sanitarian, and the faithfulness with which he has met and discharged every official duty.

Resolved, That a copy of these resolutions be spread upon the minutes of the Board, and that a copy also be presented to Dr. Frederick Becker.

AMERICAN PUBLIC HEALTH ASSOCIATION — REPORT OF DR. SHRADER

The report of Dr. Shrader as delegate of the Board to the Denver meeting of the American Public Health Association, was read, accepted, and ordered printed:

To the President of the Iowa State Board of Health:

Your delegate would respectfully submit the following report:

At no time since the organization of the American Public Health Association has there ever been a more profitable meeting held than the present one just concluded at Denver, Colorado.

Without going into details to enumerate all the localities represented, it is sufficient to say that all sections of the United States, Canada and Mexico were represented.

FIRST DAY—TUESDAY, OCTOBER 1ST.

Some sixty-five members of the Association, together with delegates and ladies, met at the Brown Palace Hotel, and were called to order by President Dr. William Bailey, of Louisville, Kentucky, who in well-chosen words congratulated those present on having the privilege of holding this session in the delightful city of Denver.

The usual address of welcome was delivered by Dr. H. Sewall, chairman of the local committee of arrangements. Much could be said about this, but time and space will not permit. He said that the duties of the Association were largely in a missionary sense

It is needless to say that suitable arrangements had been made for social entertainments for delegates and their families

When the executive committee made its report about sixty or seventy names were presented, desiring to be made members, all of whom were admitted to membership by the unanimous vote of the Association.

The first paper was read by Dr. Josiah Hartzell, of Ohio, member of the Ohio State Board of Health, "The Mississippi River as a Sewer."

I would like to report all the points brought out by Dr. Hartzell, but will be content to bring forward some of his arguments against allowing so much dead animal matter to be floated down the Mississippi. He said the immense quantities of refuse matter which were poured annually into the Mississippi were a constant damage to public health. He spoke of Chicago and the use of Chicago river for sewer purposes. Many comparisons were brought forward showing an estimate of territory drained; also the amount of putrefactive substances, dead animals, etc., that were washed into the river. The effect upon the general health of people in cities located upon the Mississippi; also of residents of Chicago, is apparent. The doctor recommended strict national legislation in regard to polluting streams, which was not only detrimental to public health, but was destroying the fish. He said that the average politician was not a sanitarian, and public health was not very much benefited by his efforts. The new drainage canal at Chicago was mentioned. The disposal of sewage in the larger cities of the world was also mentioned. Fever-plagued cities of some of the States were also mentioned. The doctor spoke of the statutes of Illinois and other States regarding the polluting of streams.

The proper way to correct these evils is to establish a government commission, similar to the English Rivers Pollution Commission, or the Imperial Board of Health. By this means the sanitary condition of navigable waters could be greatly improved. The various State Boards of Health of all the States bordering on the Mississippi are prevented from acting so long as the United States government does not show any interest in the matter. Too much stress can not be placed upon the matter of epidemics caused by polluted streams under government control, passing through the States. The purifying of streams is impractical, so long as the general government does not act in unison with the State Boards of Health. The doctor concluded his paper by recommending Congress to appoint a commission, having charge of the sanitary condition of all navigable streams.

This article was supplemented by a paper: "Water Pollution and Purification of Water Supplies," by Dr. Peter H. Bryce, of Toronto, Secretary of the Provisional Board of Health of Ontario. He brought forth some facts of international interest. He spoke about the city of Buffalo, and criticised authorities for their carelessness in distributing garbage, in order that contractors might be benefited thereby. While cities like Buffalo were being relieved, cities on the opposite side were suffering from the unpleasant effects. The doctor said that it was the duty of both Boards of Health on both sides to regulate the sanitary condition, especially regarding the St. Claire or Detroit river, and the Niagara river.

A general discussion followed the reading of this paper, in which a number of the prominent members took part. All agreed that the national government should take some action in this matter. Many excellent points were brought out and many practical hints were advanced.

FIRST DAY—AFTERNOON SESSION.

In the afternoon the ventilation of railway coaches and car sanitation were discussed. The committee on car sanitation made its report, in which Dr. Conn, of Concord, N. H., chairman of the committee, called attention to the growing interest in this subject. He insisted that employés should be held responsible for the sanitary condition of cars. The Wagner Palace Car company has instituted a school of instruction for train employés. Reports were read showing the sanitary precautions in the care of cars, etc., also drinking water.

An evening session was held in the Trinity Methodist Episcopal church. Governor McIntire delivered an address of welcome to the Association. He was followed by Mayor McMurray. Both gentlemen said many excellent things regarding the mission of our association; others present followed, making excellent remarks. Among them was Chancellor McDowell, who was the last speaker. He impressed his hearers with the expression: Give Public Health the Right of Way."

THE SECOND DAY—WEDNESDAY.

The Association met at Brown's Palace Hotel, many more being present than on previous day. The chairman of the local committee of arrangements gave an outline of various trips and excursions, together with certain social festivities. A number of new members were then admitted to the Association.

It is hardly necessary to mention in detail the discussion which took place, regarding the transmission through the mails of certain bacteriological specimens, when properly prepared. A resolution was introduced asking the Postmaster-General to permit these specimens to be carried through the mails; and samples of tubes were exhibited, also cases which had been devised by Dr. Mitchell for the purpose of conveying these specimens. These tubes and cases have been tried and proved successful. The resolution was unanimously adopted.

Timely notice was taken of the death of Louis Pasteur, that prince of investigators, who has done so much to alleviate human suffering. Words cannot express the gratitude manifested by the Association, and a cablegram of condolence was sent to Dr. Roux of Paris, expressing the sympathy of the Association.

The Advisory Council roll-call indicated that nearly all the members were present, representing the different State Boards of Health and the health officers of municipal corporations together with sanitarians throughout North America, and different departments of the United States army and navy.

At this point, I will merely mention the titles of the leading articles:

A paper on "Disinfection in American Cities" was read by Dr. Chas. V. Chapin, of Rhode Island. This was full of choice meat for the thinking mind. No one can imagine the amount of infected material used in the manufacture of bedding. Dr. Chapin called particular attention to this. He spoke of the different methods of disinfecting. The use of steam and a solution of bichloride of mercury was recommended.

In the manufacture of bedding, Mr. George J. Kendall, of Denver, was given the privilege of addressing the Association. He is a manufacturer of bedding, and he furnished a true sample, or collection of rags which were a sight to behold, and stated in no uncertain language that they were a fair sample of what was used in the manufacture of matresses. If one could see the rags comment would be unnecessary. This is dangerous and quite likely to breed disease. The Association was asked to investigate the manufacture of bedding. Mr. Kendall said he had labored for years to bring about reform in this matter, stating that he had visited the various health officials of the leading cities in this country and England, requesting their coöperation. He spoke of the various comforters, manufactured from shoddy rags. He estimated that four-fifths of the bedding is made from this stuff. A national law governing the sale of these goods, or their manufacture would greatly help in preserving the public health.

In this connection it might be well to call attention to a matter which was referred to by Mr. Kendall. It is an extract from one of the Chicago papers. A striking example is here furnished, and shows the precaution taken in regard to the fumigation of the mail from the Orient. Right here may be asked the question: What are we doing to prevent disease from being spread by the use of old rags for bedding?

Before presenting the article referred to above, I want to say that it seems to me that many of the so-called epidemics of certain diseases might be traced to the use of old rags for bedding purposes. If the United States mails from the Orient are to be fumigated, what about the present system of gathering up old rags to be manufactured into bedding? I believe that the enemy found in old rags is many times greater than the mails could possibly be.

ARTICLE FROM CHICAGO PAPER.

"Orient mail to be fumigated.—Passengers landed from the Gaelic after being inspected.—San Francisco, September 20.—The steamer Gaelic, which arrived this morning from Hong Kong and Yokohama, did not stop at Honolulu. She brought eleven passengers from Hiogo, the worst infected port of the Orient. No sickness was reported on the trip across and no alarm was felt by the ship's officers. Since last advices there has been an increase of the cholera plague in the Oriental ports. During the two weeks preceding the sailing of the ship there has been six deaths from cholera in Hong Kong, fifty-one deaths out of fifty-four cases at Fagasaki, two hundred and fifty-six deaths out of three hundred and twenty-nine cases at Hiogo and twenty-seven cases with nineteen deaths at Yokohama. After inspection by members of the Board of Health, the passengers and mail were landed and the steamer returned to quarantine.

"The postmaster to-day received instructions from Washington in regard to his suggestion directing him to fumigate all mails received from infected ports.

"The chief of police to-day ordered a house to house canvass for the purpose of compelling all citizens to put their houses in the best sanitary condition possible."

All this is in right lines, but Mr. Kendall closed by asking that this one source of contagion might receive attention.

"Micro-scopic Diagnosis of Diphtheria by a New Staining Method," was the title of a paper read by Dr. H. C. Crouch, of Denver, a member of the State Board of Health of Colorado. This was an interesting paper, which entered into detail regarding a new method of staining the diphtheria bacillus. The writer viewed with pleasure the slides prepared by Dr. Crouch. The discussion brought out many interesting points.

SECOND DAY—AFTERNOON SESSION.

The first paper read was by Dr. Jackson, of Colorado, his theme being: "Suggestions as to Ocular Hygiene in the Schools." The doctor said that children were not taught how to use their eyes. The three prominent points brought out by this paper were:

(1) The training of children in the use of their eyes.

(2) General supervision of school-room work, as to the manner in which children use their eyes should be constant.

(3) More attention should be paid to the lighting of school-rooms.

In the discussion it was stated that children were permitted to stoop over their desks. A changing of the focus of the eye from blackboard to book was mentioned as one cause of trouble of the eyes of school children. One fact was distinctly brought out, which was, that little attention was paid to bringing out the children's physical powers, and their capabilities to think, see, hear and feel. Shiny blackboards were shown to be detrimental to the eyes. I see that I shall only have time now to mention some of the more important articles, for I cannot mention all.

Dr. Wilbur, of Lansing, Mich., read a paper entitled: "On the Outlook for a General System of Registration of Vital Statistics in the United States."

This concluded the second day's proceedings.

THIRD DAY—THURSDAY.

During the morning the Advisory Council held a session, and the first announcement was the report of the Executive Committee on Resolutions offered by Dr. Wilbur during the preceding afternoon, which the committee recommended to be referred to the Committee on Nomenclature of Diseases and forms of Statistics.

The first paper was by Dr. Munn, of Denver, entitled: "National Legislation for the Care of the Public Health."

This was a well written paper and was well received, and was followed by proposing a bill for national legislation, entitled: "An act to Establish Laboratories of Hygiene in Connection with State Boards of Health Existing by Law in the Several States."

It is to be hoped that our national congress will take due recognition of the necessity of national legislation on this important subject.

Dr. A. W. Suiter, of New York, presented a paper: "On the Disposal of the Dead, Having Special Reference to the Prevalent Practice of Embalming."

The title of this article is sufficient to guarantee that much of interest was brought out.

A paper on "Medical Inspection of Schools" was presented by Dr. S. H. Durgin.

Dr. S. E. Solly, of Colorado Springs, Colo., read a paper "On the Influences Peculiar to High Altitudes." This concluded the third day's proceedings.

FOURTH DAY—FRIDAY.

The various committees were appointed for the ensuing year, also reports of committees were received.

Dr. E. Liceaga, of the City of Mexico, presented a most interesting paper, entited "A Contribution to the Study of Yellow Fever in Connection with its Medical Geography and Prophylaxis, in the Mexican Republic." "Prohylaxis of Yellow Fever" was the title of a paper read by Dr. Valle, of Mexico.

Dr. Mendizabal presented the theme: "On Baths: their Necessity, their Influence in Economy; the Dangers they Present, and the Methods of Preventing Them." Dr. Mendizabal was one of the representatives from Mexico.

"Small-pox in Wisconsin from January, 1894, to June, 1895," was discussed by Dr. Wingate, of Milwaukee, Wis.

The closing scenes were agreeable to all, and thus closed one of the most profitable seasons ever held.

MILK INSPECTION.

The recommendation of the Secretary relative to the adoption by the Board, of regulations for the inspection of milk, was referred to a special committee with instructions to report at the February meeting.

FEBRUARY MEETING, 1896.

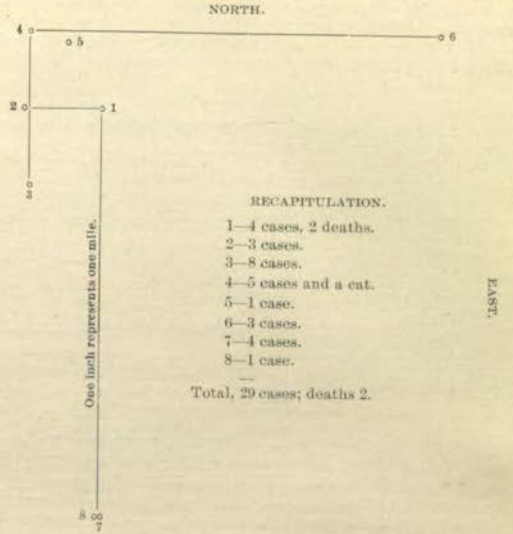
The Board convened February 5th.

There were present Drs. Guilbert, Shrader, Becker, Emmert, Carter, Scroggs, and Conniff; Prof. Stalker, State Veterinary Surgeon; and Warren Dickinson, Civil Engineer.

The Secretary presented his quarterly report which was considered *seriatim*.

ANTI-TOXIN AS A PROPHYLACTIC.

Dr. Emmert presented a detailed report of an outbreak of diphtheria in Guthrie county, as furnished him by Dr. I. S. Crosby, of Menlo, respecting the beneficial effects of anti-toxin as a prophylactic. The following diagram shows the point of incidence, "1," and progress to "8."



1. *Mr. L.* October 24th, two fatal cases of diphtheritic croup. October 25th and 27th, two cases of diphtheria. Both recovered.

2. *Mr. N.* October 25th, three cases. Recovered.

3. *Mr. C.* November 10th–December 1st, eight cases. Recovered.

4. *Mr. C.* December 18th, five cases. Recovered. Also a cat in the family died of diphtheria. The others were killed and the dog disinfected.

5. *Neighbor one-fourth mile east.* December 28th, one case. Recovered. In this family three other cases were immunized.

6. *Aunt of case at No. 5.* January 13th and three weeks later, a brother and sister of her's took sick. The three recovered.

7. *Mrs. G.* January 1st Mrs. G. took sick, the next day two sons aged fifteen and twelve years were attacked, and January 25th the husband, aged forty-five. All recovered. A child of ten in this family was immunized by anti-toxin.

8. *Mrs. W.* Across the road from Mrs. G., aged thirty-two. Recovered. Her four children (aged one and a half, three, five and seven years) were protected by anti-toxin.

The doctor reports that he was able to get a satisfactory history of exposure in every case.

Seventeen of the severer cases were treated with anti-toxin, all recovering promptly except the first two, a boy of fourteen and a girl of eleven years of age, suffering with diphtheritic croup, in both of which prognosis was "hopeless" from the start. Anti-toxin was used as a prophylactic successfully as follows: At No. 4, three children; at No. 7, one child; at No. 8, four children.

Dr. Emmert stated that he saw several of these children in consultation.

Dr. Guilbert made a supplementary verbal report relative to the Sabula food-poisoning case. He said that he had received several communications relative to the subject, yet nothing had been developed to change his opinion expressed at the last meeting of the Board, as to the character and cause of the sickness.

A bill relating to the government of plumbers was presented to the Board and referred to a committee, who reported that while they are heartily in favor of legislation in that direction the bill is impracticable, and it was recommended that further consideration be given the subject.

A bill for the regulation of embalming was presented for consideration. The Board expressed itself in favor of all legislation designed to protect the public health, but was unable at this time to give the measure the consideration necessary for a correct conclusion as to its merits.

The session was principally devoted to a consideration of the Code Commissioner's revision of the statute relating to the State Board of Health. Several amendments were adopted and recommended to committees of the House and Senate.

Rule 16 of the Board respecting the inspection of illuminating oil was rescinded. The rule is as follows:

RULE 16. In all cases of dispute between an inspector and a dealer as to a test oil, the question, together with a sample of the oil in dispute, must be sent to the office of the State Board of Health for adjudication. The sample must be so marked as to be readily identified.

MAY MEETING, 1896.

The annual meeting of the Board was held May 12th.

There were present Drs. Guilbert, Emmert, Shrader, Conniff and Carter, and Warren Wilkinson, civil engineer. Dr. Walton Bancroft, of Keokuk, was presented as the successor to Dr. Becker, and James I. Gibson, D. V. S., as the successor to Professor Stalker. Upon satisfactory evidence of their having

duly qualified, they were seated, and participated in the work of the Board.

The Secretary presented his quarterly report, which was received and referred to the standing committees by subjects.

HEALTH LAWS.

The following bills relating to the public health, which had been enacted by the legislature, were laid before the Board:

I.

AN ACT to Prohibit the Manufacture and Sale of Cigarettes, Cigarette Paper and Cigarette Wrappers, and Provide Penalties for Violations of the same.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. No one by himself, clerk, servant, employé, 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, or of any services, or in evasion of the statute, 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; or own, or keep, or be in any way concerned, engaged or employed in owning or keeping any such cigarettes, or cigarette papers, or wrappers with intent to violate any provisions of this chapter, or authorize or permit the same to be done.

SEC. 2. Whoever is found guilty of violating any of the provisions of the preceding section: for the first offense shall pay a fine of not less than twenty-five 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 costs of prosecution, or be imprisoned in the county jail not to exceed six months; *provided*, that the provisions of this act shall not apply to the sales of jobbers doing an interstate business with customers outside the State.

Takes effect July 4th.

II.

AN ACT to Prevent Blindness, and for the Care of Infants Affected With Disease of the Eyes, and to Provide a Penalty for the Violation Thereof.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. Should one or both eyes of an infant become inflamed, or swollen, or reddened at any time within two weeks after its birth, it shall be the duty of the midwife, parent, guardian, or nurse, or other person having charge of such infant, to report within six hours after discovery thereof by such person in charge of such infant, to the health officer or some legally qualified medical practitioner of the city, town or district in which the parents of the infant reside, the fact that such inflammation or swelling or redness of the eyes exists.

SEC. 2. It is hereby made the duty of attending physicians and midwives to instruct parents and nurses in regard to the provisions of this act, and the danger of sore eyes in infants.

SEC. 3. Any failure to comply with the provisions of this act shall be punished by a fine not less than twenty-five dollars, nor more than one hundred dollars, or imprisonment not to exceed thirty days, or both.

SEC. 4. This act being deemed of immediate importance shall be in force and take effect on and after its publication.

III.

AN ACT to Punish the Keeping and Maintaining of Resorts for the Sale and Use of Opium and its Preparations.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. That 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 house, shop, room or other place, and every person who resorts to any such house, shop, 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 punished by a fine not exceeding five hundred dollars, or by imprisonment in the county jail not exceeding six months, or by both fine and imprisonment.

IV.

AN ACT relating to the State Board of Health.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. That chapter 151 of the Acts of the Eighteenth General Assembly be, and the same is hereby amended by adding after the word "health," in the fifth line of said section, the following, to-wit:

"But no one of the seven physicians appointed shall be an officer or member of the faculty of any medical school in this State, and the Governor shall have the power to remove any member of said Board for good cause shown."

V.

AN ACT to Prohibit the Sale and Use of Impure Oil in Coal Mines and Providing Penalties for Violation thereof.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. That only pure animal or vegetable oil or paraffine shall be used for illuminating purposes in any coal mine in this State. If any person, firm or corporation, either by themselves or agents or employé, shall sell or offer for sale for illuminating in any coal mine in this State any adulterated oil, or any mixture or compound oil, he shall be deemed guilty of a misdemeanor, and upon conviction thereof he shall be fined not less than twenty-five dollars nor more than one hundred dollars for each offense.

SEC. 2. If any mine owner or operator or employe of such owner or operator shall knowingly use, or if any mine owner shall knowingly permit to be used for illuminating purposes in any coal mines in this State, any adul-

terated, or mixed, or compound oil, he shall upon conviction thereof be fined not less than five dollars nor more than twenty-five dollars for each and every offense.

SEC. 3. It shall be the duty of the State Mine Inspector, whenever he has reason to believe that oil is being used, or sold, or offered for sale in violation of the provisions of this act, to take samples of the same and have them tested or analyzed, and if they are found to be impure he shall make complaint to the county attorney, who shall forthwith commence proceedings against the offender in any court of competent jurisdiction. For the purposes of this act *the State Board of Health* shall fix a standard of purity of oils and regulations for testing said oils, and said standard and regulations when so fixed shall be recognized in all the courts in this State.

SEC. 4. All reasonable expenses incurred in testing or analyzing oil under the provisions of section 3 of this act shall be paid by the owner of the oil whenever it shall be found that he is selling or offering to sell impure oil in violation of the provisions of this act. Such costs may be recovered in a civil action, and in criminal prosecutions under this act such expense shall be taxed as part of the costs.

SEC. 5. Nothing in this act shall be held to prevent the use of electric lights in any coal mine in this State.

SEC. 6. This act being deemed of immediate importance, shall take effect and be in force from and after its publication in the *Iowa State Register* and *Des Moines Leader*, newspapers published in Des Moines, Iowa.

Approved March 19, 1896.

VI.

AN ACT to repeal sections one, two and three, of chapter 79, Acts of the Twenty-first General Assembly, as amended by chapter 67, Acts of the Twenty-second General Assembly, in relation to the spread of disease among swine, and to enact a substitute therefor.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. That sections one, two, and three, chapter 79, of the acts of the Twenty-first General Assembly, as amended by chapter 67, of the acts of the Twenty-second General Assembly, be and the same are hereby repealed and the following enacted in lieu thereof:

SEC. 2. That it shall be the duty of owner or persons having charge of any swine or having knowledge of their dying and upon its coming to his knowledge that any of such swine have died of, or have been slaughtered on account of, any disease, to immediately burn or bury three feet below the surface, the same.

SEC. 3. No person shall sell, or give away, or offer for sale, any swine that have died of any disease, or have been killed on account of any disease.

SEC 4. No person shall convey *along or upon* any public highway or other public ground, or any private land except his own, any diseased swine, or swine that have died of or have been slaughtered on account of any disease. And upon the trial of every information for violation 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 received and acted upon by the

court as presumptive evidence that such swine have been hauled, or are being hauled, in violation of this section.

SEC. 5. It shall be unlawful for any person negligently or wilfully to allow his hogs or those under his control afflicted with any disease to escape his control or run at large.

SEC. 6 Any person convicted of a violation of this act shall be fined in a sum not less than five nor more than one hundred dollars, or by imprisonment in the county jail not to exceed thirty days, or by both fine and imprisonment.

VII.

AN ACT granting the city or town councils the power to prohibit the use of barbed wire for certain purposes, and to provide for the removal of such wire.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. That the council of any city or town may by ordinance prohibit the use of barbed wire to enclose, in whole or in part, any lot or lots within the corporate limits of such city or town, and provide for the removal of such wire now used for that purpose, and further provide penalties for the enforcement of such ordinance.

VIII.

AN ACT raising the age of consent from thirteen to fifteen years of age.

IX

AN ACT relating to plumbing in cities and towns having sewers and a public water supply, and providing for the regulation of the same by the State Board and local boards of health.

X.

AN AMENDMENT to the statute relating to the inspection and branding of the products of petroleum—requiring the branding of all packages, casks, barrels, or vessels containing gasoline, naphtha, or benzine, with the words: "Rejected for Illuminating Purposes."

The foregoing laws were referred to a committee, who submitted the following report;

Your committee on contagious diseases would recommend that the Secretary be instructed to prepare a circular on ophthalmia for distribution.

Your committee would also congratulate the people of this State on the wise and judicious action of our legislature in passing the bill for preventing the sale of cigarettes and against the use of opium as an intoxicant in our State. Respectfully,

J. M. EMMERT,
R. E. CONNIFF,
J. F. KENNEDY,
Committee.

DISEASES OF DOMESTIC ANIMALS.

Dr. Gibson, of the Committee on Diseases of Domestic Animals, presented the following report, which was adopted:

MR. PRESIDENT—Your committee recommend the following:

That all the laws pertaining to the prevention and restriction of contagious diseases of domestic animals be printed in pamphlet form, which shall include:

First.—The laws relative to the shipment of Southern cattle into or through the State.

Second.—The laws relative to the dealing in or shipment of diseased hogs within the State.

Third.—The laws relative to glanders and the disposition to be made of animals thus affected.

Fourth.—That a ruling of the Board be made relative to the disposition of piggy sows rejected by the United States inspectors at the various stock yards within the State.

Fifth.—That the Board, directed by the attorney-general, prepare legal quarantine blanks to be used by the State Veterinary Surgeon and his assistants whenever such quarantine is indicated, in order to prevent the spread of contagious diseases among domestic animals or the transmission of such diseases to the human family.

Sixth.—That the pamphlet contain all of chapter one hundred and eighty-nine of the laws of 1884.

Seventh.—That as there is no evidence of the existence of glanders at Van Meter the matter be passed over.

Eighth.—That the pamphlet contain the laws relative to rabies, and the fact that no damage can be collected from the State or county for animals lost by said disease.

Signed, J. I. GIBSON,
WALTON BANCROFT,
E. H. CARTER.

MINERS' OIL.

The committee to whom was presented the statute relating to miners' oil, and the requirements of the Board thereunder, submitted the following report, which was unanimously adopted:

Your committee to whom was referred the formation of rules and regulations governing the use of oil for the illumination of coal mines, and for the use of miners, beg leave to submit the following, and ask its adoption:

RULE 1. The specific gravity of oil used for illuminating purposes in coal mines must not exceed twenty-four degrees Tagliabue hydrometer at sixty degrees temperature Fahrenheit.

RULE 2. All oil must be tested in a glass-footed glass cylinder one and one-half inches in diameter and eight inches deep. If the oil to be tested is below forty-five degrees Fahrenheit temperature it must be slowly heated until it reaches eighty degrees temperature. Should the oil be above forty-five degrees temperature and below sixty degrees it must be heated to seventy degrees, when in either case it shall be well shaken and allowed to cool until a temperature of sixty degrees is reached, when the test must be made.

RULE 3. In testing the gravity of oil the hydrometer must be, when possible, read from below, and the last line which appears under the surface of the oil shall be regarded as the true reading. If the oil is turbid, or opaque, one-half of the capillary attraction shall be taken as the true reading.

RULE 4. Where the oil is tested in difficult circumstances, an allowance of one-half of one degree may be made for error of parrallax.

RULE 5. Paraffine wax shall 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 loses its transparency.

RULE 6. All material used for illuminating purposes in coal mines shall be free from smoke, bad odor, and all by-products of resin known as "Mystic Oil."

RULE 7. In all cases of doubt, or question as to inspection, or as to the purity of oil or paraffine, to be used in mines, a sample of the same shall be furnished the State Mine Inspector for chemical analysis.

J. C. SHRADER,
J. I. GIBSON,
Committee.

ELECTION OF OFFICERS.

The following officers were elected for the ensuing year:

President—Dr. E. H. Carter, Des Moines.
Secretary—Dr. J. F. Kennedy.

Delegates to the American Public Health Association at Buffalo, N. Y., Drs. Carter and Kennedy; to the Iowa Public Health Association, at Davenport, Drs. Shrader and Gibson, and to the National Conference of State Boards of Health, at Chicago, Drs. Guilbert and Scroggs.

Mr. L. F. Andrews was re-elected as assistant to the Secretary and Prof. E. W. Rockwood, of Iowa City, was re-elected chemist to the Board.

The office of bacteriologist to the board was discontinued.

J. F. Kennedy was re-elected editor of the Bulletin.

Dr. Scroggs offered the following resolution, which was adopted by a rising vote:

Resolved, That the hearty thanks of this Board are hereby tendered to Dr. E. A. Guilbert for the courteous and impartial manner in which he has presided over the deliberations of this board during the past year.

Dr. Carter was inducted to his office, and at once announced the following standing committees for the ensuing year:

Auditing—Dickinson, Shrader, Gibson.
Animals—Gibson, Conniff, Guilbert.
Contagious Diseases—Emmert, Shrader, Bancroft.
Corpses—Scroggs, Bancroft, Shrader.
Food and Water—Guilbert, Emmert, Dickinson.
Kerosene—Shrader, Bancroft, Scroggs.
Legislation—The Board.

Library—Emmert, Guilbert, Scroggs.
Plumbing—Dickinson, Guilbert, Conniff.
Publications and Papers—Bancroft, Conniff, Emmert.
Rules and Regulations—Remley, Bancroft, Scroggs.
Schools—Shrader, Guilbert, Conniff.
Ventilation—Conniff, Dickinson, Scroggs.

AUGUST MEETING, 1896.

The Board convened August 6th. All the members were present.

The Secretary submitted his report for the quarter ending July 31st, which was referred to standing committees and subsequently considered *seriatim*.

SANITARY CONVENTIONS.

Dr. Emmert presented the subject of sanitary conventions, and showed the advantages to be derived from holding such conventions in different parts of the State. The subject was referred to a special committee of Emmert Bancroft and Dickinson, to report at the next meeting.

Dr. Shrader made a verbal report of his attendance with Dr. Gibson as delegate to the meeting of the Iowa Public Health Association, held at Davenport.

Dr. Guilbert made a verbal report of his attendance with Dr. Scroggs at the meeting of the National Conference of State and Provincial Boards of Health, held at Chicago, detailing the work done and the questions discussed.

DISINTERMENT OF SMALL-POX BODIES.

An application for permit to disinter bodies dead from small-pox, interred near the Missouri river, was rejected.

IMPURE WATER FOR COAL MINERS.

A communication from Dr. Brunt, relative to the dangerous and repulsive character of the water furnished to coal miners by their employers, was referred to the Committee on Food and Water. Dr. Guilbert, chairman, in behalf the committee, reported as follows:

"The Board has no statutory power in the case, but it can and should advise coal operators that common humanity demands of them the correction of these wrongs. We therefore recommend the letter of Dr. Brunt be referred to the editor of the BULLETIN, with instructions to make a synopsis of the allegations, and on that text to formulate an editorial appealing to the aforesaid mine operators to at once inaugurate such measures as will not only increase but will purify the present drinking water supply of the aforesaid mines."

INSPECTION OF HOGS.

Dr. Gibson presented the following recommendation, which was referred to the committee:

"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 supervison of the State Veterinary Surgeon before and during the Fair."

REGULATION OF MIDWIVES.

The secretary presented recommendations relative to the adoption of regulations respecting the practice of midwifery by women. The subject was referred to the standing committee, to report at the next meeting.

TRANSPORTATION OF CORPSES.

A communication was presented from the Secretary of the Western Association of Railroad General Baggage Agents' Association, respecting the regulation of the Board requiring a permit from the Board for the disinterment of corpses, and that no disinterred bodies can be shipped by railroads in Iowa.

The Baggage Association desired to "ascertain what would be necessary in the event of a disinterred body being shipped from points in other States, through the State of Iowa, to points beyond, it being understood that the proper transportation permits would accompany the body, and the State Board of Health of the State from which the body is shipped, and the health authority of the locality to which the body is consigned having consented to the removal; and whether the consent of the above mentioned health authorities would be accepted by the Iowa State Board as sufficient authority for the transportation of disinterred bodies through Iowa."

The following are the rules of the Board:

RULE 1. The transportation of bodies of persons dead of Small-pox, Diphtheria (Membranous Croup), Asiatic Cholera, Leprosy, Typhus Fever, Yellow Fever, or Scarlet Fever (Scarlet Rash), is absolutely forbidden.

RULE 2. The bodies of those who have died of Anthrax, Puerperal Fever, Typhoid Fever, Erysipelas, Measles, and other contagious, infectious or communicable diseases not embraced in Rule 1, must be wrapped in a sheet thoroughly saturated with a strong solution of bichloride of mercury, in the proportion of one ounce of bichloride of mercury to a gallon of water, and encased in air-tight zinc, tin, copper or lead-lined coffin, or in an air-tight iron casket, hermetically sealed, and all enclosed in a strong, tight wooden box; or the body must be prepared for shipment by being wrapped in a sheet and disinfected by solution of bichloride of mercury as above, and placed in a strong coffin or casket, and said coffin or casket encased in a hermetically sealed (soldered) zinc, copper, or tin case, and all enclosed in a strong outside wooden box of material not less than one inch and a half thick.

RULE 3. In cases of contagious, infectious, or communicable diseases, the body must not be accompanied by articles which have been exposed to the infection of the disease. And in addition to permit from Board of Health or proper health authority, agents will require an affidavit from the shipping undertaker, stating how body has been prepared and kind of coffin or casket used, which must be in conformity with Rule 2.

RULE 4. The bodies of persons dead of diseases that are not contagious, infectious, nor communicable, may be received for transportation to local points in this State; when encased in a sound coffin or metallic case, and enclosed in a strong wooden box, securely fastened so it may be safely handled. But when it is proposed to transport them out of the State to an inter-state point (unless the time required for transportation from the initial point to destination does not exceed eighteen hours) they must be encased in an air-tight, zinc, tin, copper, or lead-lined coffin, or an air-tight iron casket, or strong coffin or casket incased in a hermetically sealed (soldered) zinc, copper or tin case, and all enclosed in a strong outside wooden box of material not less than one inch thick. In all cases the outside box must be provided with four iron chest handles.

RULE 5. Every dead body must be accompanied by a person in charge who must be provided with a ticket, and also present a full first-class ticket marked "Corpse," and a transit permit from the Board of Health, or proper health authority, giving permission for the removal, and showing name of deceased, age, place of death, cause of death (and if of a contagious or infectious nature) the point to which it is to be shipped; medical attendant, and name of undertaker.

RULE 6. No disinterred body must be received for transportation, by any railroad, unless accompanied by a special disinterment permit from the State Board of Health, which is additional to the regular transportation permit.

The disinterment permit must be approved by the local board of health of the jurisdiction where the body was interred.

Depositing bodies in a receiving vault is deemed a burial, and a disinterment permit is required for removal.

NOTE.—Local boards should refuse to grant a permit where the cause of death is given as "heart failure," unless the physician states that it was not the result of diphtheria. In case of disinterment, the permit from the State Board of Health must be attached to the transit permit, and delivered to the person in charge of the corpses. If more than one body is shipped at one time, a separate permit must be issued for each body.

Dr. Guilbert presented the following resolution, which was adopted:

"*Resolved*, That the Secretary be, and he is hereby instructed to reply to the Secretary of the Western Association of General Baggage Agents, that the Iowa State Board of Health contemplates making no changes in existing regulations with regard to the transportation of corpses."

The circular on "Blindness of the New Born," was referred to the Committee on Publication, to report at the next meeting.

NOVEMBER MEETING, 1896.

The Board met in quarterly session November 5th. All the members were present.

The Secretary presented his report, which was referred to committees.

INFECTIOUS DISEASES.

The Secretary, for the purpose of demonstrating the importance of quarantining measles, cited from official reports for 1892 and 1893 the mortality in the State from measles, whooping cough, small-pox, diphtheria, and scarlet fever.

For 1892, total number of deaths from all causes, for the entire State, ninety-six hundred and thirty-nine. There were no reports from the following counties: Carroll, Chickasaw, Crawford, Harrison and Osceola, and in this aggregate are not included any deaths from these five counties.

The deaths from the following specified diseases were as follows: Small-pox, none; diphtheria, five hundred and twenty-seven; scarlet fever, one hundred and twenty-nine; whooping cough, seventy-seven; measles, fifty-two; classified by ages as follows: Under five years, thirty-eight; between five and ten years, two; between ten and fifteen years, three; between fifteen and twenty-five years, two; and over twenty-five years, seven. Total, fifty-two.

For 1893 the reports showed a total of ten thousand two hundred and thirty-three deaths, the counties of Chickasaw and Lyon not reporting.

The deaths from the diseases above specified were as follows: Small-pox, five; diphtheria, five hundred and thirty-six; scarlet fever, ninety-three; whooping cough, under five, seventy-four; five to fifteen, one. Total, seventy-five. Measles, under five, fifty-three; five to fifteen, three; fifteen to twenty, four; twenty to twenty-five, two; over twenty-five, two. Total, fifty-four.

It will be seen by the foregoing that for the years 1892 and 1893 in the counties reporting there were in all nineteen thousand eight hundred and seventy-two deaths. Of these deaths, five were from small-pox; one thousand sixty-three were from diphtheria; two hundred and twenty-two were from scarlet fever; one hundred and fifty-two were from whooping cough; and one hundred and sixteen were from measles.

Of the one hundred and sixteen deaths from measles ninety-one were children under five years of age, showing not only that measles is a dangerous disease but that children under five years of age are the principal sufferers.

One health officer reported a case where the body of a person dead from diphtheria was taken to another town. The funeral was held in a church and the entire lid of the coffin was removed. Fortunately but two children were present. The clothing of the deceased child was later worn by a sister and she became infected and died.

AMERICAN PUBLIC HEALTH ASSOCIATION.

Dr. Carter, President, presented the following report as a delegate of the Board, at the meeting of the American Public Health Association, which was printed in the Monthly Bulletin of the Board, and from which the following is reproduced:

The papers read on the first day were important. Drs. Granville P. Conn, President of the State Board of Health of New Hampshire; Domingo Orvananos, of the City of Mexico, Secretary of the Superior Board of Health of the Republic of Mexico, and Thomas Noriega, delegate from the State of Chipias, Mexico, read papers on Passenger Car Sanitation. Many improvements were recommended and among them impermeable paper covers for the water closet to be removed after each visit. Dr. Valentine, of New York, said that in Antwerp he had seen fresh wooden covers supplied to each new occupant of a water closet.

Dr. Frederick Mmontizambert, of Toronto, General Superintendent of Quarantine of the Dominion of Canada, chairman of the Committee on Steamship and Steamboat Sanitation, made a report and called attention to the proposed disinfection of ships by the electrolysis of sea water, a process actually in use by the French. He said an apparatus no larger than a coal scuttle could be connected with the ordinary electric plant by a couple of wires, which was capable of producing three hundred liters of electrolyzed sea water per hour.

No paper during the day attracted more attention than the one read by Dr. Josiah F. Kennedy, on the "Composition and Infectiousness of Milk." It was an exhaustive treatise, was well delivered, and attracted the earnest attention of the Association. He compared breast-fed children with those fed on cow's milk, and attributed a large proportion of deaths to inanition from dilution of the milk with water. He described epidemics due to infected milk and named numerous ways by which the germs are introduced into it. The remedies, he said, are inspection, cleanliness and sterilization. In the course of discussion Dr. Lee, of Philadelphia, said that he preferred fresh milk to sterilized, and thought sterilized milk favored the development of scurvy and rickets. Dr. Holton, of Vermont, called attention to the danger from substituting patent foods for milk.

The evening meeting was called to order by Vice-President Woodhull, and the session was opened by his Honor, Edgar B. Jewett, mayor of the city of Buffalo, who challenged the Association to find fault with the administration of the city's affairs in relation to sanitary matters. He closed his address by offering the sanitarists the freedom of the city and hoping for

them a successful convention. The Rev. Dr. Thomas R. Slicer, of the Church of Our Father, was the chief orator of the evening. His address was replete with sound sense and pungent humor. In closing he said: "Let me add, in conclusion, that the health department of any city has no business at that trough from which the politician feeds." The annual address of President Liceaga closed the exercises of the evening. The President's address, as viewed by a body of experienced sanitarians, was an able and forceful paper. It referred to the business of the Association and went into the history of the growth and development of the study of public hygiene in Mexico, which he said had been fostered and encouraged under the administration of President Diaz during the last twenty years. At the mention of the name of President Diaz there was a simultaneous outburst of applause from the large audience. Dr. Liceaga's address covered a wide range of territory, and was read in English. About two-thirds of the papers by the Mexicans were read in French, and some one would immediately follow, giving a synopsis of the paper in English. The remainder of the Mexican papers were read in English, except one, which was read in Spanish, and a translation in English, in pamphlet form, was given to each member to read while it was being read in Spanish by the author.

On the morning of the second day of the Association the inexhaustible and never-to-be-settled subject — The Disposal of Garbage and Refuse — was introduced. Papers were read and the subject was discussed extensively and earnestly.

One could, in his imagination, see that great body move like a deep sea wave with united desire to prevent disease and raise the standard of public health. This was not an assembly of new beginners, but of men of mature minds, many of whom have won fame even in more distant lands.

It was proposed to dispose of garbage by reduction, cremation, by filling in and plowing into the soil, by dumping into seas, lakes or rivers, or by being fed to animals. These various methods were recommended, varying under different circumstances. It was generally believed that kitchen garbage should be disposed of by the kitchen stove. An ingenious device was exhibited to be attached to the stove pipe, in which the garbage could be placed and dried, and used afterward to kindle the fire. It was conceded by all that the swill pail, that harbor for flies and promoter of disease, must go. That flies frequently conveyed the germs of disease from one person to another there seemed to be no doubt.

An apparatus called the Household Crematory, was on exhibition at a place near Ellicott Square, which your representative examined while in active operation. It is of cast iron and steel, handsomely finished, is ornamental in appearance, and occupying small space, being eighteen inches wide, twenty-five inches in length and twenty-five inches in height. It has an opening in the top and a cover like a privy, and may be used for the disposal of garbage, refuse and human excrement. It has a pipe like a stove and may be placed in any part of the house where it can be connected with a chimney. Refuse is placed in the receptacle through the opening in the top. Beneath the receptacle is a fire-box, in which a fire may be made every few days and the refuse consumed. It is said to be entirely odorless. It attracted much attention.

"The Quick or the Dead," was the title of a rather sensational paper read by Dr. Benjamin Lee, of Philadelphia, Secretary of the State Board of Health of Pennsylvania. It contained many sensible suggestions in regard to funerals.

Dr. Durgin, of Massachusetts, recommended steel coffins. The glass coffin was also recommended.

Prevention of blindness was discussed, and a law, such as now exists in Iowa, was recommended.

During the afternoon session many valuable papers were read. Dr. Jones, of Greenwich, Conn., recommended the establishment of a college of Preventive Medicine.

The following resolutions were unanimously adopted:

Resolved, That this Association views with pleasure the growing tendency of many States and Provinces not to manage and control the bureaus of public health by political partisans, and not to exclude from office sanitarians who may differ politically from the party temporarily in power. From a scientific standpoint, as well as in the best interests of the public health, we welcome this tendency, and take this opportunity to place ourselves on record by declaring that it is conducive to the best interests of public health to ignore political lines in the formation of state, provincial and other boards of health.

Resolved, That it is the sense of this Association that the Committee on National Health Legislation be continued and that efforts be continued to influence the Congress of the United States to establish a department of public health at Washington, D. C.

Other resolutions were adopted, and many papers were read during the forenoon. The discussion of formic aldehyde or formaldehyde gas for room and car disinfection was prolonged, and the agent highly recommended.

At the evening session the following papers attracted particular attention: "Alcoholic Drinks, from a Sanitary Standpoint," by Dr. Felix Fermento, of New Orleans, member of the State Board of Health of Louisiana; "The Bicycle in its Sanitary Aspect," by Albert L. Gihon, Medical Director United States Navy (retired); "Public Bathing Establishments," by Dr. H. Lincoln Chase, Brookline, Mass.

The paper of Dr. Fermento favored the habitual use of light drinks as a means of preventing drunkenness. The paper was warmly discussed, and many took the opposite view.

Dr. Gihon's paper on the bicycle, fully commending what he deems to be its proper use and strongly condemning what he deems to be its improper use, was a literary treat.

The public baths were so extensively explained and discussed that time forbids an attempt at doing the subject justice in this report. It was claimed that the simplest form of a public bathing place should be maintained in every town. A small room where a person could take a shower bath. A stone or cement floor is necessary, arranged so that the water can run away. The water should strike the person at an angle, leaving the head untouched, if desired. A wash rag and a towel are necessary, which should not be used a second time until scalded, thus preventing the transmission of disease from one person to another.

The following officers were elected for the ensuing year:

President, Dr. Henry Buckingham Holbeck, of Charleston, South Carolina, Health Officer of the city of Charleston. First Vice-President, Dr. Peter Henderson Bryce, of Toronto, Canada, Secretary of the Provincial Board of Health of Ontario. Second Vice-President, Dr Ernest Wende, of Buffalo, New York, Health Commissioner of the city of Buffalo. Treasurer, Dr. Henry Dwight Holton, of Brattleboro, Vermont. Secretary, Irving A. Watson, of Concord, New Hampshire, Secretary of the State Board of Health of New Hampshire, now in his fifteenth year of office.

CONTAGIOUS DISEASES—MEASLES AND WHOOPING COUGH.

The Committee on Contagious Diseases reported as follows:

We would recommend to the Board for their serious consideration the fact that out of a total of one hundred and sixteen deaths reported to the Secretary from measles in Iowa, ninety-one were under five years of age; and of one hundred and fifty-two deaths from whooping cough, all but one were children under ten years of age—these figures showing that the State Board and local boards should use every effort to educate the people of the State to the danger from these diseases to early childhood. We wish to call the attention of the Board to the imperfect manner of collecting vital statistics, and hence to their utter worthlessness to science

(Signed) J. M EMMERT,
W. BANCROFT.

QUARANTINE—HEADS OF FAMILIES.

Dr. Emmert submitted the following resolution, which was adopted:

Resolved, That when a family is quarantined for diphtheria or measles, the head of the family, or bread-winner, shall have the privilege of attending to his regular business, and of going to and from his house only when complying with the following conditions:

First.—He shall change his clothing before going to and returning from his place of business.

Second.—He shall wash his hands, face, head and beard with a 2½ per cent solution of carbolic acid, each time after 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, or to any person whose business brings him in intimate contact with children.

COMMUNICATIONS.

Dr. Gullbert, chairman of the Committee on Communications, reported as follows:

1. *Investigations Respecting Congenital Deformities*, as recommended by Dr. C. J. Bayer, of Grinnell. The study of congenital, physical and mental

deformities is a far reaching, interesting and important one. The suggestions of Dr. Bayer commend themselves to all students of heredity, and this Board would be glad to aid in any manner, consistent with its general duties, in the prosecution of that study. At present, however, your committee do not see the way clear to enter upon a special investigation of the subject.

2. *School Boards v. Local Board of Health.*—In the matter of the communication of Dr. F Y. Lynch, clerk of the board of health of Fairfield, relating to the conflict of action between said board and the school board of the town on the question of compulsory vaccination of the school children, your committee find that the local board of health, having refused or neglected to obey the health laws of the State, it was the duty of the school board to act. We also find that no school board or local board of health has the right or power to decree that certificates of vaccination must be issued by any one physician. The certificate of any physician recognized by the State Board is to be honored by all such boards. Your committee are glad to know that our accomplished legal adviser, the Attorney-General, sustains us on both these points

3. To the query of Dr. F. Robbins, health officer of Neola, we reply, and the Attorney-General again sustains us, that no school board has power to traverse the considerate action of any local board of health respecting quarantine. When the local board of health lawfully releases a child from quarantine, said child must be admitted to school promptly and without question on the part of the school board.

The report of the committee was received and adopted by the Board.

VIVISECTION.

The committee to whom was referred the communication of Dr. Walter Wyman, Surgeon-General, U. S. A., and a copy of a bill before Congress, relating to the practice of vivisection in the laboratories of the Bureau of Animal Industry, submitted the following report, which was adopted:

Your committee having under consideration the proposed legislation by the United States Congress, restricting very materially in the District of Columbia the experiments upon animals by the Bureau of Animal Industry on the ground that vivisection as practiced is a needless cruelty to animals, beg leave to submit the following report: Inasmuch as your committee believe it necessary to continue all lines of scientific investigation and do not believe the scientists engaged in such experiments are guilty of unnecessary cruelty to the animals experimented upon, but are instead benefactors not only to the animal kingdom but to humanity as well, therefore we report in favor of humanity and vivisection, and recommend that this Board instruct the Secretary to inform the chairman of the senate committee that the State Board of Health of Iowa is emphatically opposed to the pending bill (Senate Bill 1552), and entirely in favor of vivisection as carried on at present.

(Signed) J. I. GIBSON,
E. A. GUILBERT,
R. E. CONNIFF.

MIDWIVES.

Dr. Bancroft offered the following report relative to the practice of midwifery in Iowa:

The committee to whom was referred the paper of the Secretary relative to the practice of midwives, reports that it is in complete accord with the suggestions therein contained, and is decidedly of the opinion that rules for regulating the practice of midwives and defining their duties to their patients and the public should be enacted and promulgated.

It appears, however, that the midwives have already complied with the requirements of the law relative to their practice, and the possibility which suggests itself—that under the Medical Practice Act, the State Board of Health is not empowered to enforce such rules and regulations as it might make decided the committee to recommend that before taking further action the opinion of the Attorney-General be secured, as to whether the law does confer upon the State Board of Health authority to make and enforce rules and regulations for the practice of midwives.

WALTER BANCROFT,
J. M. EMMERT,
R. E. CONNIFF.

PERSONAL.

The following resolution was offered by Dr. Conniff and adopted unanimously:

WHEREAS, The term of service of Dr. E. A. Guilbert as a member of this Board will have expired before the next meeting, therefore

Resolved, That the Iowa State Board of Health hereby most cheerfully testify to the great ability and efficiency with which Dr. Guilbert has always discharged every duty connected with the Board. His extensive knowledge, varied experience and mature judgment have been of great service and a continual help to the Board, and whatever of efficiency and progress the Board may have achieved during the last seven years is in no small degree attributed to the wise counsels of Dr. Guilbert.

Resolved, That a copy of these resolutions be spread upon the minutes and published in the IOWA HEATH BULLETIN.

QUARANTINE—CARE OF THE SICK—EXPENSES.

The Secretary presented the following correspondence upon a subject deemed of importance to local boards:

DES MOINES, August 24, 1895.

Hon. Milton Remley, Esq., Attorney-General:

In the MONTHLY BULLETIN for July was given a decision, and the State Board of Health desires to know whether or not, under the statutes, said decision is in conformity with law, and if not wherein. The decision is as follows, to-wit:

"The local board of health employed a physician to attend a family quarantined for diphtheria. The county board of supervisors ordered his dismissal and sent the county physician to attend the cases, and at a meeting of the board adopted the following resolution:

"'*Resolved*, That the trustees of townships and boards of health are hereby notified that except in cases of extreme emergency no bills will be allowed by the board for medical attendance on county poor unless the physician employed by the board has been notified by the board and fails to respond.'

"Has this proceeding of the supervisors any legal force?"

"ANSWER.—County boards of supervisors cannot make regulations in contravention of a statute. The statute has vested the authority to make rules and regulations in regard to quarantine of contagious diseases in the State Board and local boards of health, and prescribes the duties of such boards. It requires that local boards shall make such rules and regulations respecting quarantine as are necessary for the public health and safety. This includes the furnishing of food, nurses, and proper care, when necessary, and medical attendance. With this the county supervisors have nothing to do, and can make no interference with regulations made by a local board in respect to such matters. The presumption of law is that sick persons may employ what physician they please to attend them. The only exception would probably be, paupers, or those under the immediate care of the county.

"The statute also provides that local boards shall regulate the fees and charges of all persons employed by them in the execution of the health laws and their own regulations. The presumption of law is that such fees and charges shall be reasonable and just. This statute is mandatory, and with it county supervisors cannot interfere.

"The statue also provides that the county must pay the expense of such quarantine if the sick are unable to pay. Providing medical attendance is a part of the expense incurred in rendering effectual provision for the safety of the people."

The facts upon which this decision was predicated are as follows: A local board of health of a township had quarantined a family on account of diphtheria, and employed a physician to attend the sick. The county board of supervisors dismissed the physician employed by the local board, and sent one of three physicians who had been previously elected by said supervisors as county physicians to attend the poor of the county. The supervisors also refused to allow any compensation to the physician who had been employed by the local board.

Section 16, chapter 151, laws of 1880, as amended by chapter 59, laws of the Twenty-fourth General Assembly, provides as follows, to-wit:

"SEC. 16. Local boards of health shall make such regulations respecting nuisances, sources of filth, causes of sickness, rabid animals, and quarantine, not in conflict with regulations made by the State Board of Health, and on board any boats in harbors or ports within their jurisdiction, as may be necessary for the public health and safety. Upon written notice given by any practicing physician, that small-pox, diphtheria, scarlet fever, or any other contagious disease dangerous to the public health exists in any place, it shall be the duty of the mayor of any incorporated city or town, and the clerk of any district township, forthwith, without other authority, to establish quarantine in such cases, as may be required by regulations of the State Board of Health and said local boards, and to maintain and remove such quarantine in like manner. If any person shall violate any such regulation as herein provided, he shall be fined not less than twenty-five dollars

for each and every day he knowingly disregards and violates the same, to be recovered by any court of competent jurisdiction. Notice shall be given of all regulations made by said local boards, by publishing the same in a newspaper published in their jurisdiction, or where there is no newspaper, by posting in not less than five public places."

Section 20, *ibid.*, provides:

SEC. 20. Whenever the Board of Health shall think it necessary for the preservation of the lives or health of the inhabitants to enter a place, building or vessel in their township, for the purpose of examining into and destroying, removing or preventing any nuisance, source of of filth, or cause of sickness, and shall be refused such entry, any member of the Board may make complaint, under oath, to any justice of the peace of his county, whether such justice be a member of the Board or not, stating the facts of the case, so far as he has knowledge thereof. Such justice shall thereupon issue a warrant, directed to the sheriff or any constable of the county, commanding him to take sufficient aid, and being accompanied by two or more members of said Board of Health, between the hours of sunrise and sunset, repair to the place where such nuisance, source of filth or cause of sickness complained of may be, and the same destroy, remove or prevent, under the direction of such members of the Board of Health.

Section 23, *ibid.*, provides that local boards shall provide "nurses, attendants, and other necessaries for the care of the sick."

In *State v. Plymouth County*, 62 Iowa, 269, the Supreme Court says this statute authorizes and requires the local Board of Health to make "effectual provision in the manner in which they shall judge best for the safety of the inhabitants."

This statute is both mandatory and directory. The local board must act forthwith, and do whatever is necessary in the premises. They are not presumed to know whether or not the quarantined persons or the sick are able to pay the expenses of such quarantine. The statute does not contemplate any inquiry in that direction. The local board is called in an emergency to act in a summary manner for the protection of the public.

By what authority can a board of supervisors interfere with regulations made, and acts done under an express statute, and dismiss a physician employed by such local board and substitute a county physician on the ground that the sick are the county poor, thereby assuming a contingency that may or may not happen at all? The county may or may not be liable for the expenses of the quarantine. That is a question for future determination.

It is a fair presumption of this statute that the sick may employ any physician they please to attend them when under quarantine, regardless of the compensation for such service. There is nothing in the statute to the contrary.

Sub-division eleven, of section 302, of Miller's Code provides that county supervisors shall have the "care and management of the business of the county, not otherwise provided by law."

Sub-division twenty provides that they shall have and exercise all the powers in relation to the poor given by law to county authorities.

Said chapter one hundred and fifty-one, provides expressly the manner, and by whom the quarantine of contagious diseases shall be established and maintained, and being a later statute supersedes the Code of 1873.

It is a fair presumption that the term "poor," as used in said subdivision twenty refers to persons under the immediate care and support of the county, or those commonly denominated as "paupers."

There is nothing in the said chapter one hundred and fifty-one authorizing a board of supervisors to assume that because persons have been quarantined for a contagious disease that they are necessarily paupers, or poor persons within the care of the county, or that the county will necessarily have to pay the expense of such quarantine.

Section 14 of said chapter one hundred and fifty-one, provides that local boards shall "regulate all fees and charges of persons employed by them in the execution of the health laws and their regulations."

By what authority can a board of supervisors set aside and cancel an agreement or regulation made by a local board with a physician, nurses, attendants, etc., in pursuance of an express statute?

A notice directed to a board of township trustees is not a notice to a local board of health. The two boards are created under different statutes with entirely separate and distinct powers and duties, as though composed of different individuals, the statute having unified the membership for convenience and utility. This doctrine is clearly established in *Sanderson v. Cerro Gordo County*, 80 Iowa, 89.

J. F. KENNEDY,
Secretary.

IOWA CITY, Iowa, September 13, 1895.

Dr. J. F. Kennedy, Secretary State Board of Health, Des Moines, Iowa:

DEAR SIR—Your favor of September 9th at hand. You set out a copy of your answer to the question whether the county board of supervisors can dismiss a physician appointed by the local board of health in a case where quarantine has been established and direct the county physician to take charge; also, where the board refuses to pay expenses of quarantine including the pay of a physician appointed by the board of health.

I would say that I think the answer given is correct, and see no special reason why any change should be made. Yours truly,

MILTON REMLEY,
Attorney-General.

JANUARY MEETING, 1897.

The Board convened January 27th. All the members were present.

The quarterly report of the Secretary was submitted and referred.

CONTAGIOUS DISEASES IN SCHOOLS.

Dr. Shrader moved that the Regulations for the Restriction and Prevention of Contagious Diseases in Public and Private Schools, reported by the Committee on Publication, be approved and declared official. The motion was adopted.

The regulations are as follows:

THE STATE OF IOWA—HEALTH DEPARTMENT.

OFFICE OF THE STATE BOARD OF HEALTH,
DES MOINES.

At a meeting of the Iowa State Board of Health, held November 6, 1896, 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 151, laws of 1880, section 2, and the same are binding upon school boards, teachers and all persons throughout the State.

By order of the Board.

E. H. CARTER, M. D.,
President.

J. F. KENNEDY, M. D.,
Secretary.

RULES AND REGULATIONS.

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.

RULE 3. Persons afflicted with diphtheria (membraneous croup), measles, rotheln, scarlet fever (scarlatina, scarlet rash), whooping cough or small-pox must be excluded from school until upon a certificate from the attending physician or health officer, showing complete recovery through 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. 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 and school officer who discovers, or who has knowledge of 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 pupil or teacher 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 and direct its proper disinfection.

TO SCHOOL OFFICERS AND LOCAL HEALTH BOARDS.

(*a*) It is best not to close the school except as above directed, for disinfection of the room or rooms. The children are more apt to meet and to visit each other socially and thus become exposed.

(*b*) In case of an outbreak of small-pox 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 not vaccinated, must be excluded from the schools until so protected.

(c) In all cases of doubt the public must have the benefit of the doubt. It is infinitely better to isolate and quarantine a suspicious case for a few days and find a harmless mistake had occurred, than to allow such an one to attend the school, and, after many had been wantonly exposed, find that a fearful and fatal mistake had been made. Prevention is inexpensive and sensible—exposure is always dangerous, and hence senseless.

EARLY SYMPTOMS OF CONTAGIOUS DISEASES.

SMALL-POX—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 is 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, uniform 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 apprehension. 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 passage.*

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, except to exclude the children 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, and tendency to bleeding at the nose, with fever, which gradually increases towards evening. There are no throat symptoms.

Typhoid fever is deemed to be the result of a special contagium, 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 their 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.

ORDER FOR 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 small-pox, 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 small-pox, 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.

BILL RELATING TO THE STATE BOARD OF HEALTH.

On motion the Board proceeded to a consideration of the report of the Code Commissioners, relating to the State Board of Health—Chapter 16, Title XII.

The following important change was unanimously recommended, relative to vital statistics:

For sections 3 and 4, as recommended by the Commissioners, the Board recommended the following as substitutes:

"SEC. 3. It shall be the duty of all assessors to obtain and report to the county auditor, upon blanks adopted by the State Board of Health, and furnished by said auditor, such registration of births and deaths as occur within their respective districts for the year ending December 31st, immediately preceding.

"SEC. 4. The clerk of the court in each county shall keep a book in which shall be recorded all marriages occurring within the county, together with such data respecting the same as shall be required by the State Board of Health, and he shall report to the Secretary of the State Board of Health on or before the 1st day of June in each year such data respecting such marriages for the year ending December 31st, immediately preceding.

"The auditor 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 three, and on or before the 1st day of June in each year shall furnish to the Secretary of the State Board of Health a report of such births and deaths."

DISINTERMENT OF CORPSES.

The committee to whom was referred a form for the disinterment of corpses in certain cases, submitted the following and recommended its adoption, and it was adopted:

STATE OF IOWA—HEALTH DEPARTMENT.

SPECIAL DISINTERMENT PERMIT.

Application having been made for the disinterment of the dead body of ..... now lying buried in .....cemetery, in the

.....of ..... county of ..... State of Iowa,
(City, town, or township)
who died on the.....day of.....18... aged....years....months.....
days, the cause of death being..... which is
contagious as shown by the certificate of death of said deceased, given by
..... attending physician, this is to certify that permission
is hereby given for such disinterment and removal to.....
cemetery in the.....of.....county of.....State of Iowa, upon
the following conditions, to-wit:

First.—That the disinterment is for the purpose of re-interment in another part of the same cemetery, or in a cemetery nearly contiguous.

Second.—That the removal shall not be by any public conveyance.

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

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

Fifth.—That the coffin shall not be opened.

Sixth.—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.

Seventh.—That this permit shall be approved by the local board of health of the.....of..... county of..... State of Iowa.
(City, town, or township)

It is understood and provided that nothing herein shall be deemed as contravening or in anywise modifying or releasing the regulations of the State Board of Health governing the disinterment of corpses.

By order of the State Board of Health, at Des Moines, the.....day of.....189..

.....
President.

.....
Secretary.

The foregoing application for disinterment and removal is hereby approved by the local board of health of the.....of.....State of Iowa, this.....day of.....18...

.....
President Local Board of Health.

(If a city or town affix corporate seal) Attest: .....
Clerk Local Board of Health.

REPORTS OF INFECTIOUS DISEASES.

Dr. Gibson presented the following resolution, which was adopted:

WHEREAS, It is the duty of the clerk of the local board of health to report promptly to the Secretary of the State Board of Health any and every outbreak of contagious disease, and it is apparent to the members of the State Board of Health that this duty is not performed in the greater number of cases, be it

Resolved, By the State Board of Health, now in session, that this Board will expect a proper notification from all local boards of health, of any and

every outbreak of contagious disease, in order that this Board may keep in touch with the local boards, and thereby be enabled to assist them in controlling and stamping out contagious diseases which are constantly destroying the lives of our people and bringing deep sorrow into many otherwise happy homes throughout our beloved State.

SHIPMENT OF DISINTERRED CORPSES.

In accordance with the instructions of the Board at the November meeting, the following question was submitted to the Attorney-General:

OFFICE OF THE STATE BOARD OF HEALTH,
November 12, 1896.

Hon. Milton Remley, Attorney-General:

Your attention is respectfully directed to the following regulations of the State Board of Health. Forms 98B and 104B, regarding the disinterment and shipment of corpses by railroad:

[Form 98B.]

TO WHOM IT MAY CONCERN.

In accordance with the Rules and Regulations adopted by the National Association of Railroad General Baggage Agents, and the Iowa State Board of Health, whenever it is desired to disinter the dead body of a human being, for removal or transportation, application for permission so to do must be made to the State Board of Health for each body to be disinterred.

The application must state the full name of the deceased, also the age, cause of death, date of death, name of physician who made certificate of death, place of burial and where to be re-interred.

No disinterred body will be received for transportation by any railroad unless accompanied by a Special Disinterment Permit from the State Board of Health, which is additional to the regular Transportation Permit.

The Disinterment Permit must also be approved by the Local Board of Health of the jurisdiction where the body lies buried.

Depositing bodies in a Receiving Vault is deemed a burial, and a Disinterment Permit will be required for removal of a body therefrom.

A body dead from diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), small-pox, Asiatic cholera, leprosy or typhus fever must not be deposited in a receiving vault.

A receiving vault in which is deposited a body dead from Asiatic cholera, small-pox, diphtheria (membranous croup), leprosy, scarlet fever (scarlatina, scarlet rash), typhus fever, must not be opened for the removal of such body, nor for the deposit of bodies dead from non-contagious diseases, nor for the entrance of living persons, and no permit will be granted for the removal of bodies from such vault.

Where the disinterment is for the removal of bodies to another part of the same cemetery, or to a contiguous cemetery, the removal must not be by any public conveyance. In such cases, it is not required that the bodies shall be prepared as for transportation by railroad or other public conveyance. But a disinterment permit from the State Board, approved by the local board, must be obtained for each body to be disinterred.

Children must not be permitted to be present at disinterments.

No permit will be granted for the disinterment of bodies dead from small-pox, Asiatic cholera, typhus fever, diphtheria or scarlet fever (scarlatina, scarlet rash), and for sanitary purposes, membranous croup will be deemed to be diphtheria.

The penalty for the digging up, disinterring, removing or carrying away any human body without lawful authority, is imprisonment in the penitentiary not exceeding two years, or a fine not exceeding twenty-five hundred dollars. [Code, section 4017.]

Blank forms of Application for Permits will be furnished on request to this office for Form 24E

Undertakers and others will save possible delay and trouble in the removal of corpses, by strictly conforming to these instructions.

These regulations apply equally to all express companies.

THE STATE OF IOWA—HEALTH DEPARTMENT.

[Form 104.] IOWA STATE BOARD OF HEALTH,
SECRETARY'S OFFICE, DES MOINES.

To all Railroad Companies, General Baggage Agents, Train Men, Station Agents, Express Companies, and Undertakers:

Complaint is made by several railroad general baggage agents who are endeavoring strictly to enforce the regulations of the State Board of Health and of the National General Baggage Association regarding the transportation of corpses, that bodies are delivered from connecting roads, when the transportation permit accompanying the body states the cause of death was diphtheria or membranous croup. Transportation or disinterment of persons dead from diphtheria, small-pox, asiatic cholera, leprosy typhus fever, and yellow fever, scarlet fever, scarlatina, and scarlet rash, is positively prohibited within this State under any conditions, for the protection not only of the public, but of railroad companies and train men, and for all sanitary purposes, membranous croup is to be deemed and treated as diphtheria. However carefully bodies may be prepared for shipment, it affords no protection against danger by collision and crushing of cars and their contents.

As a matter, therefore, of protection, justice, economy, and obedience to law, it is imperative that these regulations be rigidly observed on all railroads operated in this State.

It has come to the knowledge of the State Board that physicians, through ignorance or design, in many instances give the cause of death as "*Heart Failure, Nervous Prostration,*" *etc.*, which are sequelæ of diphtheria, when the real cause was diphtheria.

Railroad train men, station agents, and express agents would therefore be fully justified in deeming as suspicious, if not in absolutely rejecting a corpse accompanied with a permit in which the cause of death is given as "Heart Failure" where the age of deceased is under thirty years, unless there is positive statement in the physician's certificate that the "Heart Failure" was not the result of diphtheria or membranous croup. The State Board of Health has ordered that a physician's certificate giving "Heart Failure" as a cause of death, must not be accepted by a county clerk for record, and must be returned to the physician who made it for proper specification. It is known that serious results, and the loss of many lives, have followed the shipment of a corpse under false return of the cause of death.

Every transportation permit where the cause of death was a contagious disease, other than those named above or any complication thereof, must in addition to approval by the local board of health, *be approved and countersigned by the health officer of such local board* as a protection against improper shipment.

In accordance with the rules and regulations adopted by the National Association of Railroad General Baggage Agents, and the Iowa State Board of Health, whenever it is desired to disinter the dead body of a human being, for removal or transportation, application for permission so to do, must be made to the State Board of Health, blanks for which will be furnished by the Secretary.

No disinterred body must be received for transportation by any railroad, express company, or other public conveyance, unless accompanied by a special disinterment permit from the State Board of Health for each body, which is additional to the regular transportation permit, and the date of death of decedent as given in the physician's or coroner's certificate, must be taken as evidence of burial and disinterment.

The disinterment permit must also be approved by the local board of health of the jurisdiction where the body was disinterred.

The penalty for the digging up, disinterring, removing or carrying away any human body without lawful authority, is imprisonment in the penitentiary not exceeding two years, or a fine not exceeding twenty-five hundred dollars. [Code, section 4017.]

Depositing bodies in a receiving vault is deemed a burial, and a disinterment permit is required for removal therefrom.

J. F. KENNEDY, M. D.,
Secretary.

E. H. CARTER, M. D.,
President.

The object and purpose of the special disinterment permit is to prevent the possible transportation of a dead body from an infectious disease, and thus endangering the lives and health of the public. The regulations regarding disinterment apply to all bodies, regardless of the cause of death

Suppose it is desired to ship a disinterred body dead from a disease the transportation of which is not prohibited, from a point in Illinois through Iowa to a point in the State of Nebraska In such a case would it be necessary to obtain a special disinterment permit from the Iowa State Board of Health in order to transport such body through this State, it being understood that in all other regards the regulations of the States of Illinois and Nebraska regarding transportation of corpses have been fully complied with, and it being further understood that the States of Illinois and Nebraska have no regulations respecting the disinterment of bodies?

J. F. KENNEDY, M. D.,
Secretary.

DES MOINES, Iowa, September 17, 1896.

Dr. J. F. Kennedy, Secretary State Board of Health, Des Moines, Iowa:

DEAR SIR—Yours of September 2d came duly to hand, in which you enclose the rules and regulations of the State Board of Health, Form 98B and 104B, and ask:

"Suppose it is desired to transport a disinterred body, dead from a disease the transportation of which is not prohibited, from a point in Illinois through the State of Iowa to a point in Nebraska. In such a case, would it be necessary to obtain a special disinterment permit from the Iowa State Board of Health in order to transport the body through this State, it being understood that in all other regards the regulations of the States of Illinois, Iowa and Nebraska, regarding the transportation of corpses have been fully complied with, and it being further understood that the States of Illinois and Nebraska have no requirements respecting the disinterment of bodies?"

I am at a little loss to understand the exact point upon which my opinion is desired.

If the inquiry is in regard to the necessity for such rules and regulations being adopted, I beg to state that such question is not a question of law so much as what is, in the judgment of the Board of Health, necessary for the protection of public health. I assume that the Board, in adopting such rules and regulations, adopted none but those they thought to be necessary.

I assume, however, that the thought of the question is whether the Iowa State Board of Health has authority to adopt rules and regulations for the transportation of bodies disinterred in the State of Illinois, transported through the State of Iowa to the State of Nebraska, it being conceded that death was not caused by an infectious disease. In regard to this, I do not think that the fact that the body is received from another State and passes through the State, makes any difference in the authority of the Board to regulate the transportation. It is undoubtedly one of the police powers of the State which has never been surrendered to the Federal Government to protect the public health. Under the Interstate Commerce clause of the Constitution, there has been no successful attempt to defeat the police laws of the State looking toward the public health and safety.

A refusal to permit the transportation of a body that has been disinterred could hardly be considered an interference with Interstate Commerce. If, in the judgment of the State Board of Health, which under our statute has full power to make rules and regulations respecting such matters, it is dangerous to public health to permit a disinterred body to be transported along the lines of railroad in the State or through the State, it, in my judgment, has authority to make such regulations.

The question whether the transportation of such a body is actually dangerous to public health is one for the good judgment of the Board to determine. The fact that Nebraska and the State of Illinois have made no regulations in regard to the transportation of such bodies, does not prevent the Iowa State Board of Health making any regulation that it may deem necessary.

Hence, my answer to the question, as I understand it, would be that under the rules and regulations which you submit to me, they having been adopted in the exercise of the lawful powers of the Board, it would be necessary, in order to lawfully transport a body disinterred in another State across the State of Iowa, to comply with the requirements and regulations of the Board by procuring a special permit.

Yours respectfully,

MILTON REMLEY,
Attorney-General

MIDWIVES.

The following correspondence respecting the authority of the Board to regulate the practice of midwifery, was presented:

IOWA STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
DES MOINES, November 12, 1896.

Hon. Milton Remley, Attorney-General:

Section one, chapter one hundred and four, acts of the Twenty-first General Assembly, provides:

"SECTION 1. That every person practicing medicine, surgery or obstetrics, in any of their departments within this State, shall possess the qualifications required by this act. If a graduate in medicine, such person shall present his or her diploma to the State Board of Examiners for verification as to its genuineness. If the diploma is found genuine, and issued by a medical school legally organized and of good standing, of which the State Board of Examiners shall determine, and if the person presenting and claiming such diploma be the person to whom the same was originally granted, then the State Board of Examiners shall issue its certificates to that effect, signed by not less than five physicians thereof, representing one or more physicians of the schools on the Board, and such certificate shall be conclusive as to the right of the lawful holder to practice medicine, surgery and obstetrics within this State. If not a graduate, the person practicing medicine or surgery within this State, unless he or she shall have been in continuous practice in this State for a period of not less than five years, of which he or she shall present to the State Board of Examiners satisfactory evidence in the form of affidavits, shall appear before said State Board of Examiners and submit to such examination as said Board may require. All examinations shall be conducted in writing, and all examination papers, together with the reports and action of the examiners thereon, shall be preserved as the records of said board for a period of five years, during which time they shall remain open for inspection at the office of said State Board of Examiners. Such examinations shall be in anatomy, physiology, general chemistry, pathology, therapeutics and the principles and practice of medicine, surgery and obstetrics. *Provided*, that each applicant upon receiving from the Secretary of the Board an order for an examination, shall receive also a confidential number, which he or she shall place upon his or her examination papers, so that when said papers are passed upon by the examiners the latter shall not know by what applicant said papers have been prepared. That upon each day of examination all candidates be given the same set or sets of questions. It is further provided that the examination papers shall be marked upon the scale of one hundred (100), and that in order to secure a license it shall be necessary for the applicant to attain such average as shall hereafter be determined by the State Board of Examiners, and if such examination be satisfactory to at least five physicians of said Board, representing the different schools of medicine on the Board, the Board shall issue a certificate which shall entitle the lawful holder thereof to all the rights and privileges herein provided, and the physicians and the Secretary of the State Board of Health shall constitute and be deemed a board of examiners for the purpose of this act."

Section four provides:

"SEC. 4. Every person holding a certificate issued by the State Board of Examiners, shall, within sixty days after the date of such certificate, have the same recorded in the office of the county recorder in the county wherein he resides, and should he remove from one county to another to practice medicine, surgery or obstetrics, his certificate must be recorded in the county to which he removes. The county recorder shall endorse upon the certificate the date of record, and he shall be entitled to charge and receive a fee of fifty cents for his services, the fee to be paid by the applicant."

Sections eight and nine provide:

"SEC. 8. Any person shall be deemed as practicing medicine, surgery or obstetrics, or to be a physician within the meaning of this act, who shall publicly profess to be a physician, surgeon or obstetrician, and assume the duties, who shall make a practice of prescribing or of prescribing and furnishing medicines for the sick, or who shall publicly profess to cure or heal, by any means whatsoever, but nothing in this act shall be construed to prohibit students of medicine, surgery or obstetrics from prescribing under the supervision of preceptors, or gratuitous service in case of emergency, nor shall this act extend to prohibit women who are at this time engaged in the practice of midwifery, nor to prevent the advertising, selling or prescribing natural mineral waters flowing from wells or springs, nor shall this act apply to surgeons of the United States army or navy, marine hospital service, 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: provided, such physician shall furnish the State Board of Examiners satisfactory evidence of such practice, and shall procure the proper certificate, as provided in this act, and for which certificate such physician shall pay the Secretary of the State Board of Examiners a fee of two dollars, and said board shall issue to the applicant such certificate, nor shall this apply to registered pharmacists when filling prescriptions, nor shall it be construed to interfere with the sale of patent or proprietary medicines in the regular course of trade."

"SEC. 9. Any person who shall practice medicine or surgery within this State without having complied with the provisions of this act, and who is not embraced in any of the exceptions, or after being prohibited from so doing as provided in section seven of this act, shall be deemed guilty of a misdemeanor, and shall, on conviction thereof, be punished by a fine of not less than fifty nor more than one hundred dollars, or by imprisonment in the county jail not less than ten days nor more than thirty days."

Under the provisions of section one *all persons* practicing medicine, surgery, or obstetrics in this State are required to have the qualifications provided in this chapter, to-wit: a diploma from a medical school, or a successful examination before the State Board of Medical Examiners. The exceptions to this rule are set forth in section eight, among which are physicians who have practiced five years in the State prior to the passage of the act, and midwives in practice at the time of the passage of the act. (April 9, 1886.)

The evident object and intent of this statute is to protect the people against incompetency of those who profess to practice medicine, surgery, or obstetrics. The only reference to midwives is in section eight. It is a

fact that a very large proportion of obstetrical practice in this State is performed by midwives, and that they often assume and usurp the functions of physicians; and too often without any qualifications at all.

Not only is this practice an encroachment upon the rights and practice of those who have fully conformed to the requirements of the statute, and a violation of the evident purpose of the statute, but it is a constant menace to the public health. In many counties of the State, the records show that a majority of the births are attended by midwives.

The question arises whether or not midwives in practice subsequent to the passage of the act, are, under its provisions required to procure a certificate from the State Board of Medical Examiners, or are under any restrictions whatsoever. Also, whether there is any provision in said chapter for the practice of midwifery except by duly authorized physicians, and by the women designated in the exceptions specified in section eight.

Section two, chapter one hundred and fifty-one, Acts of the Eighteenth General Assembly provides:

"SEC. 2. The State Board of Health shall have the general supervision of the interests of the health and life of the citizens of the State. They shall have charge of all matters pertaining to quarantine; they shall supervise a State registration of marriages, births and deaths, as hereinafter provided; they shall have authority to make such rules and regulations and such sanitary investigations as they may from time to time deem necessary for the preservation or improvement of the public health; and it shall be the duty of all police officers, sheriffs, constables and all other officers of the State, to enforce such rules and regulations, so far as the efficiency and success of the Board may depend upon their official coöperation."

Section five provides:

"SEC. 5. It shall be the duty of all physicians and midwives in this State to register their names and postoffice address with the clerk of the district and circuit courts of the county where they reside; and said physicians and midwives shall be required, under penalty of ten dollars ($10), to be recovered in any court of competent jurisdiction in the State, at suit of the clerk of the court, to report to the clerk of the courts, within thirty (30) days from the date of their occurrence, all births and deaths which may come under their supervision, with a certificate of the cause of death, and such other facts as the Board may require, in the blank forms furnished, as hereinafter provided."

It is a question with the State Board of Health whether or not under the provisions of said chapter one hundred and fifty-one the Board has authority to make rules and regulations defining the duties of midwives, not only to the public, but when attending the prospective mother and her offspring at the most critical period of their lives.

The Illinois State Board of Health has prepared under a statute almost identical with chapter one hundred and fifty-one, such regulations.

Your opinion is respectfully requested as to whether or not said regulations are in contravention of the powers and duties of the Iowa State Board of Health, to make regulations for the preservation or improvement of the public health, as prescribed in said chapter one hundred and fifty-one, or in chapter sixteen, title XII, of the Code Revision, page five

hundred and seventeen, which is identical with chapter one hundred and fifty-one, and which has been agreed upon in both houses of the Legislature.

J. F. KENNEDY, M. D.,
Secretary.

STATE OF IOWA,
OFFICE OF ATTORNEY-GENERAL,
DES MOINES, January 25, 1897.

Dr. J. F. Kennedy, Secretary State Board of Health, Des Moines, Iowa:

DEAR SIR—Your favor of recent date at hand, enclosing me a copy of the rules and regulations adopted by the State Board of Health of Illinois, which you say is organized and operating under a statute almost identical with chapter one hundred and fifty-one of the Eighteenth General Assembly of Iowa. You ask my opinion as to whether or not the Iowa State Board of Health has power, under our law, to make rules similar to those adopted by the Illinois Board of Health.

I have not examined the act under which the Illinois State Board of Health is acting, and do not undertake to pass upon the question, not even by inference, as to whether or not the Illinois State Board of Health has exceeded its authority in adopting such rules. The rules submitted to me, however, appear to be of comprehensive direction to midwives as to the manner of performing their duties, covering nearly every conceivable case, the last rule being this: "Midwives must conscientiously guard the secrets of their patients, and must only divulge them if the law requires them to do so."

In reply to your inquiry, I beg to state that I know of no statute of the State of Iowa which gives to the Board of Health authority to make such rules and regulations. You call my attention to the following clause of section two of the act under which the Board was organized: "They (the Board) shall have power to make such rules and regulations and such sanitary investigations as they may, from time to time, deem necessary for the preservation or improvement of public health." If the Board of Health has authority to enact such rules, it is not under this clause of the law.

If I were to concede that this clause of section two gave the State Board of Health power to legislate and make laws and regulate all matters affecting public health, yet in my judgment, under well settled principles, it would have no authority to legislate upon the subject proposed. By what is called the Medical Practice Act, or chapter one hundred and four of the Twenty-first General Assembly, the Legislature has enacted a law upon the subject of the practice of medicine, surgery and obstetrics. It must be conclusively presumed, in the absence of some statutory provision showing a contrary purpose, that the laws adopted by the Legislature upon that subject were all that it deemed necessary.

Excessive indulgence in intoxicating liquors affects the health. The Legislature has enacted a law regulating the sale. Because the Board might deem such laws insufficient for the purpose, I do not think they would be authorized to supplement the laws enacted by the Legislature by rules and regulations which they may adopt. Any subject upon which the law-making power has legislated, cannot be considered one upon which Boards created by the Legislature may legislate.

Suppose your Board thought the practice of certain schools of medicine was injurious to the public health; could it be claimed it had the right to

prohibit physicians of such schools practicing? Suppose certain remedies and manner of treating diseases were by the majority of the Board thought to be injurious to the patient; would it be claimed that on that account this Board could prohibit such practices, and determine that none other than those methods recommended by the Board should be used? I cannot think that any such powers were intended to be given by the Legislature to this Board.

I do not think that the general terms used in section two, such as "The Board of Health shall have the general supervision of the interests of the health and life of the citizens of the State," and "They shall have authority to make such rules and regulations and such sanitary investigations as they may, from time to time, deem necessary for the preservation or improvement of public health," will justify the conclusion that the Board is given unlimited authority to legislate upon every subject that enters into the question of public health.

In regard to quarantine, they are given ample jurisdiction. In some matters referred to in said section, I think their duties are merely advisory and educational. They may gather statistics in regard to marriages, births and deaths; they may make sanitary investigations. I will not at this time undertake to say the extent to which the Board may go in making rules and regulations which shall have the force and effect of law. I am clear, however, that there is a limit to the power of the Board. Virtue, sobriety, plain food, regular habits of life of the individual are all conducive to health. Any rule or regulation which inaugurates or compels correct methods of living among the masses, would be a means of improving public health.

If, under the clause quoted, the State Board of Health may make every rule and regulation which they deem necessary for the improvement of public health, there is no end to the subjects on which they may make regulations, controlling even the manner of life of the individual. This appears to me is unwarranted by the Act of the Legislature, and would be usurpation of power. Yours respectfully,

MILTON REMLEY,
Attorney-General.

KEROSENE INSPECTION.

The following amendment to the regulations for the inspection of kerosene was adopted:

"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."

DISINFECTION.

The Committee on Infectious Diseases reported the following change in the regulations for disinfecting rooms in which had been persons sick with contagious diseases, especially relating to the removal of the paper from the wall. The amendment was adopted:

"If the disease was scarlet fever (scarlatina, scarlet rash) or small-pox 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 walls shall be thoroughly dusted and brushed." Of course the disinfection by fumigation, ventilation and other means must be thoroughly practiced in all cases.

MAY MEETING, 1897.

The Board held its annual meeting May 5, 1897. There were present Drs. Carter, Conniff, Bancroft, Emmert, Scroggs, Shrader, Guilbert (the latter having been reappointed by the Governor); Dr. Gibson, State Veterinary Surgeon, and Warren Dickinson, civil engineer.

The Secretary presented his quarterly report, which was read and referred.

TRANSPORTATION OF CORPSES.

The following communication from the chairman of the Committee of the General Railroad Baggage Agents' Association was presented and referred to the Committee on Transportation of Corpses:

MICHIGAN CENTRAL RAILROAD COMPANY,
OFFICE OF GENERAL BAGGAGE AGENT, CHICAGO, April 21, 1897.

To Iowa State Board of Health:

GENTLEMEN—At the Richmond meeting of the American Association of General Baggage Agents, a committee consisting of W. H. Gummere, Lehigh Valley railroad; G. E. Byram, Fitchburg railroad; P. Walsh, Atchison, Topeka & Santa Fe; E. A. Sadd, Chicago, Burlington & Quincy railway, and H. P. Dearing, Michigan Central railroad, was appointed to confer with health authorities and funeral directors with a view of ascertaining if any changes or modifications of the rules for transporting dead bodies, was desirable, and if so, to try to agree upon a ground work of rules to be considered by the several associations of health officers, railways, and funeral directors at a later date.

What we have termed association "Rules for the Transportation of Dead Bodies," has, with certain modifications and additions, been embodied in and become the rules of a number of state boards of health, and while the railways should be credited with maintaining them in some localities in the absence of State or territorial action, in a majority of States I believe the matter is now substantially out of our hands. At the same time the railways are vitally interested in the matter, not only with the general public, but we have a special interest in protecting the lives of our employés, and again, in dealing with our patrons it is very desirable that the rules be uniform; particularly, when it is proposed to transport a body through several States or provinces, which occurs daily; and while it is

conceded, I believe, that the rules of this association were an improvement on the methods that obtained previous to their adoption, the changes and modifications (which may be good) mentioned above, have caused a lack of uniformity, so desirable from our standpoint; and we wish to ascertain if it is possible to have uniformity of laws and rules for transporting the dead, and the question is asked: Has there not been sufficient progress in sanitary work, and in the practice of embalming as to warrant a modification of Rule 1, as applying in some localities? Is it not possible for skilled embalmers to prepare a body for shipment, even if dead of some of the diseases prohibited in Rule 1 so that it may be transported without any danger whatever?

Is it not possible to have such skilled embalmers examined by competent judges and licensed, and thus avoid placing the skilled and the ignorant workmen on the same level in this practice? If there is a demand for it, and interested parties are able and willing to pay for scientific work, and there are, on the other hand, those sufficiently skilled in the art of embalming to make the transportation of such a body safe, should not our rules be so framed as to permit it?

Our committee has been directed to confer with health authorities and funeral directors, and to report at a meeting to be held in Denver, October next, and I have been requested by the committee as their chairman to undertake to arrange a date for a joint conference, and we are particularly anxious to have the attendance of some representative health officers, so that if an agreement can be reached, we may reasonably hope for approval on the part of the several State boards and provincial boards of health.

I would ask, therefore, if you would attend such a meeting the middle or latter part of May, provided it is held at Cleveland or some central point; so far as the members of our committee are concerned, we would be glad to arrange to meet at any point most convenient to you. I wish each of you would invite any other health officers whose attendance you think desirable, and upon receipt of replies, I will name the date and place suggested by a majority.

An early reply is solicited. Yours truly,

H. P. DEARING,
Chairman G. B. A. Committee.

The committee submitted the following report, which was adopted:

Your committee on corpses, to which was referred the letter of Mr. H. P. Dearing, general baggage agent Michigan Central railway, of date April 21, 1897, attached herewith, respectfully submit the following report:

The committee believes it to be of the utmost importance that uniform rules and regulations for the transportation of corpses should be adopted, and that this Board should make an honest effort to secure the adoption of such rules.

We believe such can be done in this direction by presenting the matter at the conference of State Boards of Health to be held at Nashville, Tenn., August 18th and 19th, and would suggest to Mr. Dearing that his committee be present at that meeting, and in case this meeting can be arranged, that

our representatives be instructed to make every effort to secure a uniform system of rules as proposed.

(Signed.) J. A. SCROGGS,
J. C. SHRADER,
W. BANCROFT.

REGULATIONS FOR QUARANTINE OF CONTAGIOUS DISEASES.

The Secretary submitted the following revised regulations for quarantine of contagious diseases, Form 130B, which were referred to the standing committee:

[Form 130B.]

RULES AND REGULATIONS FOR THE PROTECTION OF PUBLIC HEALTH AND FOR THE RESTRICTION AND PREVENTION OF CONTAGIOUS DISEASES.

QUARANTINE.

1. It shall be the duty of every physician 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, small-pox, diphtheria (membraneous croup), scarlet fever (scarlet rash, scarlatina), typhus fever, measles or other disease dangerous to the public health 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 herein named. 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 and custody of any lodging rooms to give notice in like manner as required herein of physicians.

2. It is the duty of the mayor or township clerk (as the case may be), as provided by law, upon notice given by any practicing physician that small-pox, diphtheria, scarlet fever or any other contagious disease dangerous to the public health exists in any place, forthwith, without other authority, to establish quarantine in such cases, as may be required by regulations of the State Board of Health and said local boards, and to maintain and remove such quarantine in like manner.

3. Quarantine shall be deemed to be:

(a) The placing of a yellow cloth or card not less than eighteen inches square, having imprinted thereon the name of the disease in large letters, upon such conspicuous place on each building, hall, lodging room, or place wherein exists a contagious disease, as will best protect the public health;

(b) Separation of the sick from all other persons, if possible, and from all persons except the members of the family, the attending physician, and nurses;

(c) The complete exclusion of all persons from the premises;

(d) That no person shall leave said premises except the attending physician, without a permit therefor signed by the mayor (or clerk) and countersigned by the health officer;

(e) 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;

(f) That when nurses are employed to care for the sick they shall not be permitted to leave the premises during such employment, and where neighbors, relatives or friends serve as nurses, they shall not be permitted to leave the premises without previous change of clothing, proper disinfection, and a permit from the mayor (or clerk, as the case may be).

4. Quarantine shall be established and maintained in each and every case for the period named herein, to-wit:

Scarlet Fever.—(Scarlatina, scarlet rash) forty days from date of the rash, desquamation having completely ceased, and there being no appearance of sore throat.

Diphtheria.—(Membraneous croup) thirty-five days.

Measles.—Twenty-one days, or until cough and desquamation have ceased.

Small-Pox.—Forty days.

Asiatic Cholera.—Twenty-one days.

Typhus Fever.—Until complete recovery and twenty-one days thereafter.

5. When a family is quarantined for diphtheria or measles, the head of the family or bread-winner, shall have the privilege of attending to his regular business, and of going to and from his house only when complying with the following conditions:

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 2½ per cent solution of carbolic acid, each time after 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, or to any person whose business brings him in intimate contact with children.

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.

6. Whenever there is complete recovery 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.

7. No order for the release of quarantine shall be made by the mayor (or clerk) as the case may be, except upon a report from the attending physician stating the number of persons on the quarantine 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, or clerk, 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 clerk) 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.

8. No person, whether an 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 these regulations, unless the same has been previously thoroughly disinfected, and such disinfection approved by the mayor (or township clerk) and health officer. And the danger signal shall be maintained upon the premises until such disinfection is made.

9. 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 health officer of the local board.

10. When Asiatic cholera, small-pox, diphtheria (membraneous croup), scarlet fever (scarlatina, scarlet rash), leprosy, yellow fever, typhus fever, 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 (or clerk), countersigned by the health officer.

11. 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 wfth 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. The statute having provided that the expenses of quarantine of contagious diseases shall be paid by the county, it is best and safest to employ nurses to attend the sick, as the isolation can be more rigidly maintained and exposures prevented, instead of permitting the assistance of friends and neighbors.

CARE OF THE SICK.

12. 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 10 is placed. The room must have no carpet, simply rugs; must previously be cleared of all needless clothing, drapery and other material likely to harbor the poison of the disease. Provision must be made for the introduction of a liberal supply of fresh air, without sensible currents or drafts.

13. The discharges from the throat, nose and mouth are considered 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.

14. The discharge 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 100 feet of any well. All vessels must be kept scrupulously clean and disinfected.

15. Nurses and attendants must keep themselves and their patients as clean as possible—their own hands frequently washed and disinfected 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 much exposed to the contagion of the disease.

16. 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.

SMALL-POX.

Vaccination is the only preventive for small-pox. 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 revaccinated 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 generally admitted to be 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.

17. 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.

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.*

SCARLET FEVER.

Scarlet fever is now believed to be 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 frequently 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. While it is not definitely *proved* that the germs of scarlet fever are propagated in any substance outside the living human or animal body, *it is possible that they may be found to be thus propagated.* Therefore, and because the breathing of air laden with emanations from decaying meat, or from sewers, cesspools, sinks and other receptacles of filth is believed to endanger health, great care should be taken to have the house, premises and everything connected with dwellings, kept clean and dry, to have sewer connections well trapped, and house drains constantly well ventilated, and to have all carriers of filth well disinfected Do not permit a child to enter a privy or water-closet, or breathe the air from a water-closet, cesspool or sewer into which non-disinfected discharges from persons sick with scarlet fever have entered, or drink water or milk which has been exposed to such air.

Do not permit a carriage or hack used for funeral purposes from premises wherein death has occurred from scarlet fever, to be used again until it has been disinfected.

Do not permit a child to ride in a hack or other closed carriage in which has been a person sick with scarlet fever, except the carriage has since been thoroughly disinfected.

Do not permit a pupil of the public school to re-enter school without the necessary certificate that the proper precautions have been observed.

Do not permit a child to attend school from any family or building in which there is a case of diphtheria (membraneous croup), scarlet fever,

scarlet rash, scarlatina, or has been such, within a period of thirty-five days previous. Public schools are a most prolific source for the spread of this disease.

Do not handle or wear clothing worn by persons during their sickness or convalescence from scarlet fever.

Do not permit a cat or dog or fur-bearing animal to enter a room where a person is sick with scarlet fever.

Beware of any person who has a sore throat. Do not kiss such a person nor take the breath of such a person. Do not drink from the same cup nor use any article that has been used by a person sick with this disease.

Remember that scarlatina and scarlet rash are scarlet fever.

MEASLES.

18. Measles is a highly contagious and often fatal disease, hence is dangerous to the public health, and subject to quarantine regulations.

19. Every person known to be sick with measles, or suspected to be sick with that disease, must be isolated from all other persons except the necessary attendants fifteen to twenty-one days.

20. 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 no visiting permitted. Heads of families doing outside labor, and not nursing the sick, may go about their usual vocation, keeping aloof from other children, subject to Rule 5.

When the sick have fully recovered, and there are no more exposures, and the rash, scurf and cough have disappeared, the quarantine may be removed although the twenty-one days may not have elapsed.

The specific poison or infection of measles is in the rash which invades the membranes of the nose, throat, lungs and bowels before and often more severely than the skin, so that it is infectious 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.

21. Whooping cough is an infectious disease. A pupil of the public schools affected with it must be excluded from the schools until entire recovery. He should be isolated from all other children. There is no necessity for quarantining adult members of the family, or the premises, except to exclude children from schools and public gatherings. The premises must be placarded.

TYPHOID FEVER.

It is the opinion of the best and most experienced sanitarians that typhoid fever is a disease which has no right to 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 in a privy vault, on a manure pile, or on the ground, whence they sink into the earth, through the soil, even a mile into the well.

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 impure water.

The disease is not considered contagious in the sense that small-pox, 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 of 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.

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.

There is good reason to suspect the water of a well whenever a vault is situated within 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.

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 a solution of chloride of lime, and kept there until they can be boiled, or put in boiling water as soon as removed from the patient. It is important that 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 washer-women 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 accidently 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, and placarding the premises are 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 a solution of corrosive sublimate or carbolic acid.

Nurses and others in the family should eat nothing in the room where the patient is, nor 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 the house, to boil all water and milk just before using.

It is especially important that the *contents* of the privy be disinfected. For this purpose use four ounces of the best quality of "chloride of lime" to each gallon of material in the vault.

PUERPERAL FEVER.

Puerperal fever is a fearfully fatal disease. Hence, every attendant upon cases of labor should, by the use of antiseptic measures, sedulously guard against the occurrence of the disease. The hands and all instruments and appliances should be washed in a solution of corrosive sublimate (one to one thousand parts), 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.

THE DEAD.

22. A body dead from Small-pox 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.

23. The body of a person who has died from Asiatic cholera, typhus fever, yellow fever, leprosy, diphtheria (membranous croup), scarlet fever (scarlatina or scarlet rash), or measles, 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 buried immediately, without the attendance of any person other than is necessary for the interment thereof.

24. NO PUBLIC FUNERAL shall be held of any person who has died from either of said diseases named in Rule 23, 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.

25. 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, 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 any such funeral.

26. 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. And 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 forthwith removed from service and be disinfected before being used again.

No dead body of a human being shall be buried within a city or incorporated town, nor in any burial place used or controlled by any city or incorporated town within this State, without a burial permit issued and signed by the clerk or recorder of such city or town. A burial begins when the body is prepared for burial.

DISINTERMENT.

27. Whenever it is desired to disinter the body of a human being for removal or transportation, a separate application for permission so to do must be made to the State Board of Health for each body to be disinterred, on blanks furnished by the State Board.

The application must state the full name of the deceased, also the age, cause of death, date of death, name of physician who made the certificate of death, place of burial, and where to be reinterred.

28. No disinterred body must be received for transportation by any railroad unless accompanied by a special disinterment permit from the State Board of Health, which is additional to the regular transportation permit.

29. The disinterment permit must be approved by the local board of health of the jurisdiction where the body lies buried.

30. Depositing bodies in a receiving vault is deemed a burial, and a disinterment permit will be required for removal of a body therefrom.

31. A body dead from diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), small-pox, Asiatic cholera, leprosy, yellow fever, or typhus fever, must not be deposited in a receiving vault.

32. A receiving vault in which is deposited a body dead from Asiatic cholera, small-pox, diphtheria (membranous croup), leprosy, scarlet fever (scarlatina, scarlet rash), yellow fever, or typhus fever, must not be opened for the removal of such bodies nor for the deposit of bodies dead from non-contagious diseases, nor for the entrance of living persons, and no permit will be granted for the removal of such bodies from such vault.

33. Where the disinterment is for the removal of bodies to another part of the same cemetery, or to a contiguous cemetery, the removal must not be by any public conveyance. In such cases it is not required that the bodies shall be prepared as for transportation by railroad or other public conveyance. But a disinterment permit, approved by the local board, must be obtained for each body disinterred.

34. Every transportation permit where the cause of death was a contagious disease, or any complication thereof, must in addition to approval by the local board of health, be approved and countersigned by the health officer of such local board as a protection against improper shipment.

35. Children must not be permitted to be present at disinterments.

36. No permit will be granted for disinterment in any case of a body dead from Asiatic cholera, small-pox, leprosy, typhus fever, yellow fever, scarlet fever (scarlet rash, scarlatina), diphtheria (membranous croup), or from any sequelæ of or complications of said diseases.

37. Where the cause of death is given as "heart failure," and the age of decedent is under thirty years, it must be deemed as suspicious, and no railroad transit permit be issued thereon by a local board until investigation is made by the health officer, unless there is a positive statement in the physician's return that the "heart failure" was not the result of diphtheria.

The penalty for the digging up, disintering, removing or carrying away any human body without lawful authority is imprisonment in the penitentiary not exceeding two years or a fine not exceeding $2,500.

38. The transportation of bodies of persons dead of small-pox, diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), Asiatic cholera, leprosy, typhus fever, or yellow fever, is absolutely forbidden.

INSTRUCTIONS TO LOCAL BOARDS.

The Secretary submitted the following Circular of Instructions to Local Boards, Form 99B, which was referred to the standing committee:

[Form 99B.]

INSTRUCTIONS FOR LOCAL BOARDS OF HEALTH.

ORGANIZATION.

The mayor and council of a city or incorported 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 irregular 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 or take a recess, and re-convene as a local board. This, for the reason that the local board is created, and derives its powers 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 service 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 the 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.

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 Form 28B.

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, 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.

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. It may quarantine against the town whenever deemed necessary. Where a city or town embraces an entire township the local board of the city or town has superior jurisdiction.

Mumps and whooping cough are infectious diseases, and a child infected with either must be excluded from the public schools, and isolated from other children until recovery.

There is no necessity in quarantining adult members of a family in cases of mumps and whooping cough, nor in quarantining the premises, except to exclude children.

Quarantine applies to all institutions, public or private, city, county, or State.

Quarantine against persons or premises must not cease until thorough disinfection is had, and there is no further danger from infection.

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 means the complete isolation of the sick from the well, except the physician and nurses. The quarantine must be maintained the prescribed period succeeding the appearance of the last case of the disease in the family, or on any premises, except that whenever there is complete recovery 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. The attending physician cannot order, establish, maintain nor release quarantine.

HEALTH OFFICER.

The statute requires every local board of health to appoint 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 and 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 authorized 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 acting by order of the local board.

It is not his duty to attend persons quarantined for contagious diseases. The sick 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 symptoms 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 the 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 they shall judge necessary for the public health and safety.

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.

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 public in the enjoyment of life or health is a nuisance, which it is the duty of a local board to abate. With nuisances 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. An action by A for its removal must be upon the ground that it is dangerous to the public health, and not because it is unsightly and obnoxious to his own residence or premises. A declaration of the local board that it is a nuisance is not necessary as a condition precedent to give A a right of action

for damages. The statute does not give local boards exclusive jurisdiction to determine what constitutes a nuisance and to abate nuisances. But 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, they must first order the owner or occupant to remove it within twenty-four hours. If he neglects to do so they may proceed summarily to cause such nuisance to be removed. If the danger to public health is imminent, and safety requires immediate suppression or abatement of the nuisance, the board of health would be protected if they proceeded at once to suppress it, for the safety of the people is the highest law. If any unhealthy nuisance is found in a public place it is the duty of the board of health to cause its immediate removal.

The State Board of Health has no authority whatever respecting the removal or abatement of nuisances. That authority is vested solely in local boards and the courts.

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 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 school room all the pupils in such room shall at once be dismissed and the school room 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.

PENALTY.

The statute 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, any one 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."

The committee presented the following report which was adopted:

The Committee on Publications and Papers, to which was referred the circular relative to quarantinable diseases, Form 130B., report favorably upon the recommendation of the Secretary, and advise that two thousand copies be printed; also report the same relative to the circular of Instructions to Local Boards of Health, Form 99B., and recommend that two thousand copies be printed. (Signed)

W. BANCROFT,
J. M. EMMERT,
R. E. CONNIFF.

VITAL STATISTICS.

The Secretary submitted the following forms for securing vital statistics under the provisions of the acts of the special session of the Twenty-Sixth General Assembly, which were adopted:

RECORD OF BIRTHS.

Name of child.	SEX.		DATE OF BIRTH.			Place of birth. Town or Twp.	Mother's full maiden name.	Father's full name.
	M.	F.	Mo.	Day	Yr.			

RECORD OF DEATHS.

Full name of deceased.	AGE.			Occupation.	DATE OF DEATH.			Married, single, widow, or widower.
	Y.	M.	D.		Mo.	Day.	Yr.	

Where born.	Place of death. (Town or townsihp.)	Cause of death.	Place of burial.

ASSESSOR'S RETURN OF BIRTHS.

Full name of child..... sex..... date of birth, month..... day..... year..... place of birth (town or township) ..... mother's full maiden name..... full name of father.....

ASSESSOR'S RETURN OF DEATH.

Full name of deceased..... sex..... age, years.....months ..... days..... occupation..... date of death, months..... days..... years..... single, married, widow, or widower.....where born ..... place of death (town or township) ..... cause of death..... place of burial.....

TUBERCULOSIS.

Dr. Emmert presented a paper upon the prevention of tuberculosis, which was heartily approved and ordered printed. It will be found in another place in this report.

HOG CHOLERA.

The committee on Infectious Diseases of Animals submitted the following, which was adopted:

WHEREAS, The Legislature, at the request of his excellency, Francis M. Drake, Governor of Iowa, has recently passed a bill requiring State and county officials to coöperate with the Department of Agriculture at Washington, D. C., in the experiment of the federal government to control and stamp out hog cholera, be it

Resolved, That we, the members of the Iowa State Board of Health, are in sympathy with the movement, and ask the local boards to join in coöperating with the Department of Agriculture in this special attack upon the fell destroyer of our swine industry; and that we recognize and appreciate the deep interest shown in this movement by the Hon. James Wilson in the financial welfare of our swine breeders and feeders.

(Signed.) J. I. GIBSON,
R. E. CONNIFF,
E. A. GUILBERT.

ELECTION.

Dr. J. M. Emmert was unanimously elected President of the Board for the ensuing year, and Dr. J. F. Kennedy was re-elected Secretary and editor of the Bulletin.

Prof. S. R. Macy, Highland Park College, Des Moines, was elected Chemist to the Board, and Dr. Eli Grimes, of Des Moines, Bacteriologist.

Drs. Emmert and Bancroft were elected to represent the Board in the next meeting of the American Public Heath Association, to be held at Philadephia, Pa.

Drs. Guilbert and Shrader were elected to represent the Board at the Annual Conference of State Boards of Health to be held at Nashville, Tenn.

Dr. Emmert on taking the President's chair, announced the following standing committees for the year.

STANDING COMMITTEES.

Auditing—Dickinson, Shrader, Gibson.
Animals—Gibson, Shrader, Scroggs.
Communications—Guilbert, Bancroft, Conniff.
Contagious Diseases—Shrader, Bancroft, Carter.
Corpses - Bancroft, Guilbert, Dickinson.
Food and Water—Guilbert, Conniff, Scroggs.

Kerosene—Carter, Gibson, Shrader.
Legislation—The Board.
Library—Conniff, Scroggs, Guilbert.
Plumbing—Dickinson, Carter and the Secretary.
Printing—Carter and Dickinson.
Publications—Scroggs, Gibson, Shrader.
Rules and Regulations—Remley, Guilbert, Gibson.
Schools—Carter, Bancroft, Conniff.
Tuberculosis—Shrader, Gibson, Bancroft.
Ventilation—Scroggs, Shrader, Carter.

FUNCTIONS OF THE STATE BOARD OF HEALTH.

An erroneous opinion very generally exists throughout the State as to the powers and functions of the State Board of Health.

Under the new Code, the following sections contain all the powers and duties of the Board, which are found in Chapter sixteen, Title XII.

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. 2574. The Secretary of the State Board of Health shall receive such salary as the State Board shall fix, not to exceed twelve hundred dollars 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.

The theory of this statute is to vest in *local boards* the authority to protect the public health, prevent and control contagious diseases, and abate nuisances affecting the health of the public. To this end the remainder of the chapter, with the exception of sections 2564, 2566 and 2567, is made directory to such boards, and it is only in cases of emergency that the State Board is given authority to enter their jurisdiction with superior authority.

The powers and duties of the State Board are so clearly defined they cannot be misunderstood. There is much that might be done beneficial to the public health outside of the present means of the Board, and which would be energetically undertaken, but for the limitations of the statute. A noticeable instance in this respect is that of nuisances.

Frequent application is made by petition of citizens to the Board to aid in securing the removal of a nuisance caused by a stock-yard or a creamery, averring they are unable to secure relief through their local board because members of the board are owners of, or have pecuniary interest in the causes of the nuisance. There are also complaints of slaughter-houses, improper sewerage or drainage, hog-pens, unburied dead animals, etc., all of which are, or may become greatly injurious to the health of the community wherein they exist.

The Board is regretfully compelled to turn a deaf ear to such requests for the reason that the statute has given it no authority to abate a nuisance or make any order therefor. The authority to do so is vested in local boards, and it is made their duty to provide such regulations, and take such action as will protect the public health and prevent the doing of anything which injures or annoys the public in the fullest enjoyment of life and health. Whatever contaminates the air and water of a community is a nuisance.

Where a local board neglects or refuses to act in relation thereto any citizen may petition the district court for an injunction against the nuisance. An action may also be brought against the members of the local board for neglect of official

duty. The city or township is also liable for all damages that may accrue by reason of the neglect or malfeasance of such local board. For instance, there is an outbreak of small-pox or diphtheria, or any preventable contagious disease; or there may be a nuisance in the community injurious to the public health, and the local board of health neglects or refuses to take the necessary measures to prevent and abate the same, whereby there is loss and damage to the individual, the board would be liable for such loss or damage, and in the event of loss of human life they would be clearly liable to indictment for manslaughter.

Local boards should thoroughly understand their duties and responsibilities under the law and execute them faithfully and impartially. The people have the right to expect and demand that this shall be done. The expediency of a statute is not a question for local boards to determine. Their duty is to execute the law as it is, not as they or even their community may think it should be. If they cannot and will not do this they should resign their office.

Another mistake in regard to the functions of the State Board of Health relates to the practice of medicine. This Board has no jurisdiction whatever in such matters. Indeed the only reference in the old Code to physicians and midwives was a requirement to register their names and addresses with the clerk of the court of the county in which they practiced, and to report to such clerk all births and deaths occurring within their practice. Under the new Code even this small service is not required, and the only reference whatever to physicians is the simple statement that at the annual meeting of the local board a competent physician shall be elected health officer of the board.

The State Board of Health and local boards have nothing whatever to do with issuing certificates to physicians or with the prosecution of physicians or midwives who may be violating the medical practice act—a statute entirely distinct from the statute relating to the State Board of Health. The Board of Medical Examiners only in part consists of members of the State Board of Health.

MILK.

IN THE SUNNING YARD.

Probably no article of human food has within the past decade received so much consideration by the medical profession, scientists and sanitary organizations, as milk. It is the universal food, and more especially of children. It is estimated that the milk supply of the United States amounts to about twenty-five and one-half gallons to each person per year, or an ordinary sized tumblerful each day.

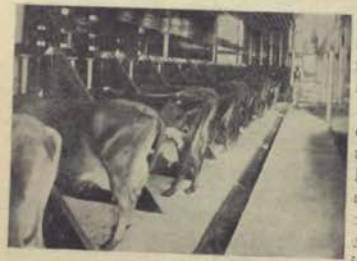
Hitherto science has given its effort principally to cheapening and improving butter and cheese. Rarely has it given attention to the milk production of the farm. Sanitarians have recently taken up the work, and special effort is being made to secure pure milk.

"All healthy cows may be trusted to perform their part well in the production of wholesome milk," said Mr. George Abbott in his work on milk legislation. But between the trusty cow and the consumer, and the children especially, stand the nasty barn and yard; the unclean udder; the filthy milker; the unclean milk vessels, the impure water, and the convenient pump, supplemented with dairies, groceries, lunch rooms, and eating houses generally. Added to all these are the present conditions of civilization, especially in cities and towns, respecting hygiene, proper exercise, ventilation, dietetics and dress, which

have wrought such deterioration of women as to render them unable to properly nurse their children, thus forcing them to artificial feeding, and to the use of that abominable, murderous invention, the rubber tube and nipple.

These are the objective points of present effort, and it is a pleasure to state that rapid progress is being made to abolish these intervening menaces to the purity of milk for the adult as well as the babe. Already, near the cities of Boston, New York, Philadelphia, Baltimore, Chicago, Montreal, St. Louis, Buffalo, New York, and Providence, Rhode Island, have been established large farms, and laboratories by the Walker-Gordon Laboratory Co., illustrated from photographs in this article, which are thoroughly equipped for the production of milk for use in families and nurseries in its natural condition. The barns and milk houses are constructed and kept in strict accord with the most approved sanitary science. The cows are selected for their milking qualities, and tested with tuberculin before admitted to the herd. They are given the best and most nutritious food. The milk is protected, from the act of milking to its delivery to the consumer, against the danger of infection. The cow and her attendants, with their hands and clothing, are especially guarded against germs of disease. Every vessel used in the milk-house, the glass milk-pails and milkers' clothing are all sterilized, after washing, by apparatus in constant use. So soon as drawn the milk is filtered, cooled, aërated, put into sterilized bottles, and sealed. The milkers wear white clothing while milking, which is washed after each use.

A MODEL BARN.



MODEL STABLE.

MILK ROOM.

The beneficial result from using milk procured as here shown, has been fully demonstrated in the several cities contiguous to these farms. In the city of New York there was distributed by the health department among the poor people during the year 1896, six hundred and fifty-eight thousand and sixty-four bottles of sterilized milk, the principal distribution being through the months of July and August. The saving of the lives of eight hundred and four children during those two months by the use of this milk is claimed by the department.

A PASTURE.

The city of Brooklyn, for the same year, and the month of August, distributed forty thousand bottles of sterilized milk. Says the report of the Health Commissioner: "Beginning with the last week in June, the infant deaths were twenty-three per cent of the whole mortality of the city; the first week of July, twenty-three per cent; the second week, twenty-eight per cent; the third week, twenty-seven per cent; the fourth week, twenty-one per cent. With the introduction of sterilized milk in the first terrible two weeks of August, the percentage fell to eighteen; in the second two weeks in which the milk was more generally distributed, to eleven per cent."

Similar reports come from other cities where protected milk is distributed. They tell conclusively the intimate connection

between the supply of a pure milk diet and the needless infant mortality which goes on every year in crowded communities.

While the demands of small cities would not warrant such elaborate equipments as are cited above, yet much good can be done by a simple plant and moderate expenditure. The purpose of this writing is more especially to show what is being done, and how, in order to lessen the desolation of so many homes.

FILTHY MILKING.

MILK SEDIMENT.

It is not uncommon for consumers of milk to find in vessels in which milk is furnished a sediment at the bottom. It is largely composed of excrementitious matter from the cow, dropping from the udder during the process of milking. The accompanying microphotograph, prepared by Dr. Gray, of the Army Medical Museum, is from a sample of milk taken at random in the milk market at Washington, D. C. It shows the deposit is composed of epthelial debris, hairs of the cow, excrementitious matter, vegetable fibers, organic and inorganic dust particles, bacteria, fungi and spores of every description, fully ninety per cent being excrementitious bacilli, presenting a mass which might well cause the stomach of the average housewife to rebel.

In 1894 the Wisconsin Experiment Station found deposited on the bottom of a milk pail ten inches in diameter, the milk being drawn from the unwashed udder of a stabled cow, sixteen thousand four hundred bacteria. At the same time, where the udder and flank were washed, the number of bacteria was but twenty-six hundred.

EFFECT OF IMPROPER FOOD ON MILK.

In the report of the health officer of the District of Columbia for the year 1895 is the following respecting the effect of food on the milk of a cow:

The disease described as milk sickness or trembles by some American writers, and characterized by great weakness, constipation, vomiting, fetor of breath, and muscular twitchings, is believed to be due to cows feeding on Rhus toxicodendron. The evidence on this subject is, however, conflicting. Cases of diarrhœa, and even severe forms of gastroenteritis, have been traced by Sonnenberger, Ratti, and Mackay to the milk of cows and goats feeding upon meadow saffron and euphorbiaceous plants. The milk of animals fed on carrot and turnip tops and often from the first spring pasture is changed in an unaccountable manner, and has frequently caused vomiting and diarrhœa in hand-fed children. Husemann regards among the meadow plants apart from different species of Euphorbia and Ranunculus, also the Gratiola officinalis, Aethusa Cynapium or fool's parsley, Cytisus Ramentaceus, and different varieties of sorrel and mushrooms especially objectionable.

The milk of swill-fed animals has often a peculiar taste and odor, and is said to cause hyperacidity of the urine and consequent eczema. M. Toussant called attention to the fact that in the district of Argenteuil deaths from gastro-intestinal diseases have increased in frequency among bottle-fed children since the establishment of a large distillery, the cows being fed on brewers' grain and other distillery products, and the milk presented an acid reaction. But this acidity is by no means constant, as Uffelmann and Ohlsen have often found it alkaline. Ostertag states that the milk of animals fed with expressed sugar beets is destructive to calves on account of the excess of potassium, and hence objectionable for human consumption. Bollinger reports injurious effects from ricinus oil cakes, and Schmidt-Mühlheim attributes diarrhœal attacks to the admixture of wild mustard in the rape seed oil cakes fed to cows. Colah quotes Herkemer as saying that cows having inhaled the putrid emanations of a dead and decomposing cow yielded a milk quite unfit for making cheese, and Mr. Smee, quoted by the same writer, asserts that "the milk of cows fed on sewage farms rapidly putrifies." It is quite true that cows, whenever an opportunity affords, feed greedily upon animal and human ordure, and an impure water supply for cattle has frequently been accused of causing an epidemic of milk typhoid. While this connection is not proven, it will be readily understood how the udder can become infected while the animal is wading in filth and polluted streams. All of which clearly indicates the necessity of sanitary control of dairies, enforced cleanliness in milking, and the proper care and feeding of the animals.

Ostertag states that the milk of animals fed with expressed sugar beets is destructive to calves, on account of the excess of potassium, and hence objectionable for human food.

DISEASED ANIMALS—DANGERS OF MILK THEREFROM.

In 1895 the Health Officer of Manchester, England, reported an epidemic effecting one hundred and sixty persons with

symptoms of diarrhœa, sickness and abdominal pains, the cause of which was traced direct to their milk supply, which came from cows suffering with garget.

Professor Gaffky reports several cases of acute specific enteritis which he traced to the milk of an animal suffering from that disease. It is more common among herds supplying milk to cities and towns than is generally supposed. A recent instance of milk poisoning from garget is reported by W. R. Stokes, Bacteriologist to the Health Department of the city of Baltimore.

In one of the educational institutions of the city about twenty inmates were suddenly seized with marked nausea, vomiting and purging. Careful investigation was made and the milk used was suspected as the cause. The herd from whence the milk came was visited and one of the cows was found suffering from a swollen udder, and garget, caused, the owner supposed, by a bruise. The udder was thoroughly cleansed and milk drawn in a sterile glass tube, with no contact between the teat and tube. A microscopic examination showed that this fluid consisted almost entirely of pus cells, together with numerous streptococci. The milk from two other cows of the herd also contained about ten to twenty pus cells to the field of a $\frac{1}{12}$ inch oil immersion lens.

These cows were removed from the herd, and all intestinal trouble among the students immediately subsided.

Dr. Booker, of Johns Hopkins University, at Baltimore, in a recent complete research on "Summer Diarrhœa of Children," brings out clearly the relationship existing between certain forms of gastro-enteritis and the streptococcus. The Health Department of the city of Baltimore finds that milk containing more than five pus cells to the field of the oil immersion lens must be excluded from sale and use as food, and cows producing such milk must be removed from dairy herds.

The milk of animals suffering from puerperal and other septic fevers is unfit for food. Escherich, who examined specimens of milk from mothers suffering from puerperal fever, found the pyogenic germs in twelve, and Karlinski found the staphylococci not only in the milk of the mother but in the blood and intestinal contents of the infected infant.

The milk from animals suffering from foot and mouth diseases is equally unfit for food.

Feser, Manolzkoff and Nocard have actually demonstrated the bacillus anthracis in milk; hence the milk of animals affected with anthrax should not be used.

Nocard has experimentally proven that the virus of rabies may be conveyed in the milk of a cow suffering from that disease. It seems incredible that such an animal should be milked at all.

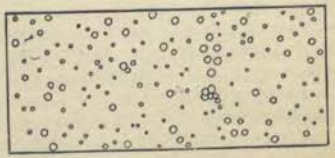
It has long been held that the milk of cows suffering from digestive derangements is of an abnormal character, and, according to Siedamgrotzky, Fröhner, and Brauer, it is usually quite watery, of a bitter taste, and generally coagulates within six to eight hours after milking, with the formation of very little acid, so-called "sweet curdling." When we remember that if nursing mothers indulge freely in fresh fruit and green vegetables their milk is apt to gripe and purge their infants, we can appreciate how cows' milk, under the above circumstances, may produce mischief.

For further facts about milk, the Report of R. A. Pearson, Assistant Chief, Dairy Division, Bureau of Animal Industry at Washington, is cited.

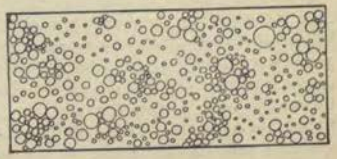
COMPOSITION AND CHARACTERISTICS.

Milk is a whitish, opaque liquid. To the ordinary observer it appears to be a perfect soulution, and is commonly regarded as such, being bought and sold by liquid measure, but when placed under the microscope it is seen to consist of a clear, transparent fluid containing many minute globules of various sizes (fig. 1*b*). The fluid part, called the milk serum, consists of water and all the other constituents of milk except the fat, and these other constituents, although solids when separated and dry, are practically all dissolved in the water, or, as is said, in solution. The globules are little bodies of pure fat scattered through the serum and

a. Skim milk



b. Milk.



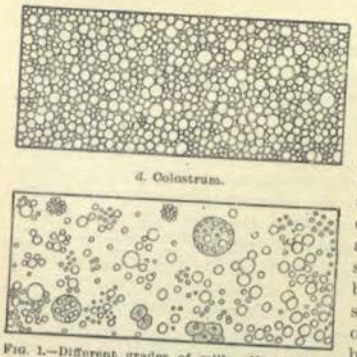


FIG. 1.—Different grades of milk. (Magnified 300 times.)

not dissolved; they are semi-solid and form with the serum a mixture called an emulsion.

The solid constituents present in the serum in largest quantity are sugar and casein; albumen and mineral matter are present in small quantity, and there is also a little fibrin resembling the fibrin of blood. There is more sugar in milk than any other solid component, but it is in solution. This milk sugar can be separated and brought into solid form. As solid, it resembles powdered white sugar. It is used to a considerable extent by druggists and in some food preparations, but is not as sweet as cane sugar and its commercial value is not sufficient to induce its manufacture in large quantities. It is the sugar which undergoes the greatest change when milk becomes sour. The casein and albumen of milk are its nitrogenous constituents and are comparable to the white of an egg. Acid or rennet causes casein to coagulate, forming curd and, as such, it is one of the chief ingredients of cheese, constituting about one-fourth of that important food. The mineral matter in milk, called ash or salts, is the indestructible part that remains when milk is evaporated to dryness and burned; this consists chiefly of phosphates and chlorides of soda, potash, and lime.

It is well known that when sugar is dissolved in water the solution is less limpid than pure water, and if many small bodies a very little lighter than water were thoroughly mixed into the solution their rise would be more or less retarded by the stickiness of the surrounding fluid. Milk might be compared to a thin syrup with many fatty and light particles floating in it, as just described. It is viscous or sticky, because of the solids held in solution, and this viscosity, together with fibrin, has a considerable effect in retarding the rise of the fat globules and the formation of the cream layer. The older

milk is, the more effective are these forces. The fat globules are so small that a single drop contains many millions of them. It is said that if a person should attempt to count the globules in a drop of milk it would take ten years of his time, provided he counted at the rate of one hundred per minute and worked ten hours per day six days every week. Such a number is too large to be appreciated. The globules average about one ten-thousandth of an inch in diameter, and twenty-five of average size placed side by side would about represent the thickness of ordinary writing paper. Globules of different sizes are found in the milk of any cow, but with certain breeds the size is uniformly larger than with other breeds. The milk of Jersey and Guernsey cows has this peculiarity, which explains why the cream rises so readily on it and why the skim milk is so thin and poor, large globules naturally being able to get to the top more quickly than small ones, many of which cannot rise at all.

One hundred pounds of good milk contains about the following amounts of the different constituents: Eighty-seven pounds of water, four pounds of fat, five pounds of milk sugar, 3⅝ pounds of casein and albumen, and ⅞ pound of mineral matter or salts. These proportions are graphically shown by figure two on the next page.

These constituents vary between wide limits; the total solids of milk may be as low as ten or as high as eighteen parts in one hundred. This variation is due to several causes, some of which are given later. The fat varies in quantity more than any other part of the milk, running as low as two parts in one hundred and as high as seven; the larger the proportion of fat the richer is the milk. Most of the States and many cities have a legal standard for the composition of milk, and any falling below this standard is legally regarded as adulterated although it may be, in fact, the pure and natural product. The laws usually require three or three and one-half per cent of fat, and nine or nine and one-half per cent of "solids not fat." (This term is commonly used to designate all the solid substances of milk other than fat.) The "total solids" required thus vary from twelve to thirteen per cent, according to different laws, which means, of course, that in every one hundred pounds of milk there shall be twelve or thirteen pounds of solid matter. These legal requirements are justified by the

fact that it is the solid matter and not the water which gives value to milk.

The fact that the standard so often relates to the proportion or percentage of fat, and the popular impression that milk is without value after the cream has been removed, lead some people to think that fat is the only valuable part of milk. This is a great error, as casein is one of the cheapest forms in which

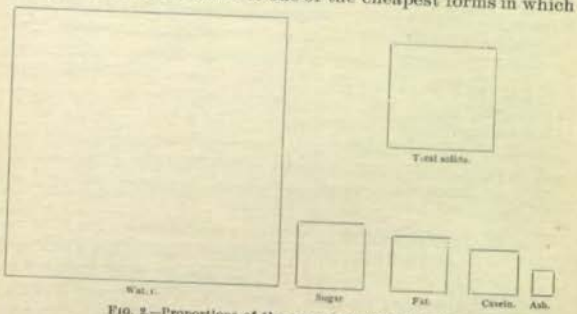


FIG. 2.—Proportions of the component parts of milk.

such food can be obtained, and is more nutritious than similar compounds in most other foods. It is, however, safe to judge of the quality and value of milk by the fat it contains, because the greater the proportion of fat the greater is the quantity of the other valuable parts, or "solids not fat."

CAUSES OF VARIATION IN THE COMPOSITION OF MILK.

The proportion of constituents in milk depends largely upon the kind of cows. Jerseys and Guernseys, by some people incorrectly called Alderneys, produce a rich milk, on which the cream rises quickly and completely; this is a decided advantage to those who wish to raise cream, but not if the milk is to be used whole. It may be a positive disadvantage, in some cases, to have the cream separate too soon. Durham and Ayrshire cows give milk of an average quality, from which the cream rises slowly, and on this account they are sometimes said to be good "milkman's cows." Holstein milk usually has a small proportion of fat or cream, but some families of these "black and whites" supply a product of excellent quality. The Holstein cows are noted for producing enormous quantities of milk.

Although these statements refer to pure-bred cows of the different breeds named, they also apply to grade animals having one-half or more of the blood of these breeds. All cows of the same breed do not give milk of the same quality; in fact, the composition of milk from cows of the same breed may vary as much as that from cows of different breeds. As a rule, however, similarly bred cows, under like conditions, give about the same quality of milk at corresponding times during the period of lactation. It is a popular notion that the feed given a cow influences the quality of her milk more than anything else; but if a cow in normal condition gives a rich milk at one period her milk will be of good quality at all times, unless she is badly neglected or diseased. Feed has a much greater influence upon the quantity of milk produced than upon its quality.

The first milk given after calving is called colostrum (Fig. 1, d). It contains a large proportion of albuminoids and is somewhat laxative. It is not fit for food, except for the newly born. In natural milk a small amount of albumen is present, but in colostrum the albumen often exceeds the amount of casein, and these two constituents may form over fifteen per cent of the milk. The percentage of sugar in colostrum is usually low; the fat is normal. The composition of colostrum changes rapidly, and within a few days after birth of the calf natural milk is given. After this the percentage of fat in the milk from any cow varies more or less from day to day, even if her feed, care and general treatment are always alike. The causes of the sudden changes are not always known; in fact, the fat often seems to increase or decrease without any cause. Sometimes the fat content changes over thirty per cent within twenty-four hours. As the period of lactation progresses there is a tendency to gradually increase in the total solids and the physical condition of the milk is so altered that cream rises less easily.

In well-regulated dairies each cow is milked about ten months of the year; the remainder of the year she is said to be "dry." When a dairyman takes the product of his herd to a cheese factory it is the custom to have all the cows giving milk in the summer time and none in the Winter, but when he supplies milk to customers he endeavors to have a small part of the herd dry at a time, so there will always be enough cows in milk to supply his trade. An incidental advantage of this is, the milk

from fresh cows is added to that from those more advanced in the milking period and the changes due to the time of lactation are avoided in the mixed milk, which is thus kept of uniform quality.

DIFFICULTIES IN OBTAINING PURE MILK.

The first thing to be borne in mind is that milk is naturally a pure product. If any milk is found unclean, unwholesome, or disproportioned in its proper parts, the chances are that it is not the fault of the cow. In all such cases the presumption is that some person is to blame, either the one who cares for the cow or the one who handles the milk. If those who buy milk used proper care they would have little trouble in always procuring a good, clean article. It is possible to produce milk free from contamination, and if impure milk is delivered the dairyman or dealer may be held responsible, and it is the duty of the customer to reject it. When the milkman knows that his customers will not accept poor or unclean milk he will stop offering it.

On the other hand, some people are most unreasonable in their complaints and demands upon their milkmen. This, and the sharp competition between rival dealers, are two chief causes of dishonesty in the milk business. When a milk peddler knows that he is delivering the best of milk and complaint is made that it is not yellow enough or has not enough "body," and he is afraid of losing a good customer, he is naturally tempted to either give that person a supply from near the top of a can, thus depriving some one else of cream which rightly belongs to him, or to do what he thinks his dishonest competitor is doing, whatever that may be. There is a great desire to get milk cheap, and it is not an unknown thing for customers, including hotels and private institutions as well as private families, to demand such large measure for their money that the dealers feel compelled to "extend" the milk in order to meet these requirements and prevent loss of trade. Some are satisfied with the adulterated stuff, not knowing that the same amount of actual food, but no more and perhaps less, is being delivered in the large measure than was formerly delivered in the small one. This explains how it sometimes happens that milk is retailed in cities at less than the regular wholesale price. People too easily forget quality and think only of quantity. The only sensible thing for the housekeeper or other buyer of milk to do, is to willingly pay a fair price and insist upon good milk in return. Buyers should remember

that at the highest prices usual anywhere, good milk is about as cheap an article of food as can be purchased.

It should also be borne in mind that milk can be contaminated as easily after delivery to the family or consumer as before, and too often a milkman is blamed for bad milk or cream when it was made so by conditions over which he had no control. If left where dust can settle in it or flies have access to it, or if set in an ill-ventilated cellar or in a warm place, it is pretty certain to be in bad condition after a few hours, no matter how good it was when delivered.

Numerous well-authenticated cases are known where customers have complained of milk received, and upon investigation it has been proved that servants in the house tampered with the milk, removing cream for their own use or adding old milk or vinegar to make it sour prematurely. The object of the latter act was, in connivance with an outsider who supplied the motive, to cause the buyer to change to some other dealer whom the servant was ready to recommend.

Attention on the part of consumers to the proper way of producing and handling milk would result in a great improvement in this most important food. Laws will do much to prevent fraud, but customers who know exactly what they want, how to get it, and how to care for it, have a much greater effect on milk producers and dealers than any possible laws.

CHANGES OF MILK.

Pure as milk may be in its natural state, it is a perishable product, and although with a proper knowledge of its peculiarities and care in its keeping it can be held in a wholesome state a reasonable length of time, there are natural changes which are sure to occur as soon as opportunity is given. Thunderstorms, impurities, warm temperature, and other conditions known to exist when milk is most liable to give trouble have been blamed for its changes. But it is now known that these are only indirect causes, and that the changes in milk which bother the housekeeper are due to, and cannot take place without, the presence of minute organisms called bacteria.

Any milk having a large amount of sediment is suspicious. Particles of dirt are a sign that germs are abundant. Thus dirty milk may be dangerous as well as disgusting. The dirt in milk consists mostly of particles of dead skin and manure, which fall into the pail from the body of the cow during milking; but dust in the stable, and dirt and dust in the vessels used for handling milk, and unclean attendants, are also common sources of dirty sediment in milk.

Milk from unhealthy or unthrifty cows or that which has been handled by sick persons is dangerous, as it may contain infectious germs or foreign substances which might affect the health of the consumer. The germs of typhoid fever, scarlet fever, diphtheria, and consumption (or tuberculosis) have been found in milk, and thus transmitted to man, and spread from family to family. Feverish cows, those having just given birth to a calf, and sometimes cows that have been milked a long time, produce milk which should not be used. Any milk having an unnatural appearance should be discarded.

Odors and peculiar flavors are due to bacterial action or to the volatile oils of some foods; onions, turnips, cabbage, and certain weeds, as garlic and wormwood, give characteristic odors and tastes to milk.

CARE OF MILK.

The proper care of milk after it has been delivered to the consumer is a matter of great importance. It is desirable to have it in the best condition possible for use, and it is not desirable to blame the milkman for things for which he is not in the least responsible. If milk is kept in an open vessel in a refrigerator with meats and various kinds of vegetables, it will absorb odors from them. It is also sensitive to flavors, and if allowed to stand in an old tin dish the "tin taste" can easily be recognized. Milk should therefore be kept in a cool place, free from odors, and in a perfectly clean vessel of suitable material. A well-glazed earthen or porcelain dish, or a glass jar or bottle, is the best container; tin is good so long as bright and the iron is well covered. Wooden dishes are objectionable.

FIG. 3.—Dairy thermometer.

As already stated, the change to which milk is most liable is simple souring, and the best agents to prevent this change are cold and heat. There should be no trouble in keeping milk sweet at a temperature of fifty degrees Fahrenheit from twenty-four to thirty-six hours after it is in the hands of the customer. But this can not be done unless it is delivered in good condition and properly handled after delivery. It is the custom in some places to leave the milk in dishes on the doorstep early in the morning, and it often remains there exposed to heat, dust, insects, and small animals until wanted in the house. This is a bad practice. In hot weather, milk exposed

in this way for any length of time should soon sour, and if it does not it is probably due to the presence of preservatives. Too much care cannot be used in seeing that the milk is cold when delivered, and that it is then immediately put into a cool place. If allowed to stand in the warm air, even for a few minutes, the time it will keep sweet is shortened. Of course it will keep longer at a temperature between thirty-five degrees and fifty degrees Fahrenheit than above fifty degrees Fahrenheit.

Sometimes milk does not keep sweet when no cause can be discovered for its souring. This is frequently the case in Summer. Often the trouble is the refrigerator, which may seem cold on account of the great difference between its temperature and that outside, while it is in fact, not cold, and a thermometer may show its temperature to be even above sixty degrees Fahrenheit. A floating dairy thermometer (figure 3) is a convenient article to have in the house. It is a closed glass tube with a paper scale inside; it can be put into a fluid without injury, stands upright in the liquid, and is easily cleaned. The temperature of the milk should occasionally be taken when it is removed from the ice chest and the cause of early souring may be found.

PASTEURIZATION.

Pasteurization of milk is now being extensively practiced, and it is found to be an especially good means of preservation when it is difficult or too expensive to keep the milk at a sufficiently low temperature to prevent souring until wanted for use. A large proportion of the germs are killed by heat. When sufficient heat is used to kill all the germs the product is called sterilized milk, and may be kept in good condition indefinitely.

The advantages of pasteurized or sterilized milk are several, the most important being the destruction of some or all of the germs which may be present. For this reason alone it is thought advisable by some to use heat whenever the source of milk supply is not known, or when any epidemic is in the community, and some even recommend that all milk be boiled before it is used. If for any reason it is desired to keep milk longer than usual, as for a sea voyage, pasteurization will be a great help. There are some disadvantages in pasteurizing or sterilizing milk. If a sufficient degree of heat be used to kill all infectious germs a scum appears on the top, which is the albumen of the milk coagulated by heat; beside this, a boiled

taste is acquired, which is objectionable to some persons, though very pleasant to others; and milk thus treated is found to be a little less digestible than raw or natural milk. If a high degree of heat be used the sugar is scorched and forms a brown deposit in the bottom of the vessel. An advantage of pasteurizing at home, if it is advisable to do this at all, is that one knows the quality of milk he gets, as it is easier to judge milk while fresh than when cooked.

The pasteurization of milk is an extremely easy operation, and if mothers better appreciated the dangers to which their little ones are exposed from the use of raw milk from unknown sources, especially in the summer time when it may be teeming with bacterial growth, more of them would use this simple precaution. It is estimated that one-third of all children die before they are three years old, and one of the leading causes of infant mortality is unwholesome milk. Bad milk cannot be made perfect by pasteurization, but the danger from its consumption can be lessened. The process is very simple and the necessary apparatus is inexpensive.

Briefly, the directions are as follows: One or more bottles nearly full of milk are plugged with dry absorbent or other clean cotton and placed in an upright position in a vessel having a false bottom and containing enough water to rise above the milk in the bottles (Fig. 4). The vessel is closed, placed on the stove and heated until the water is one hundred and fifty-five degrees F., if in Winter, or to one hundred and eighty degrees (or even to boiling if special precautions are deemed necessary) in Summer. It is then removed and kept tightly covered for half an hour. A heavy cloth over the pail will help to retain the heat. The milk bottles are then taken out, cooled as quickly as possible by cold water or ice, and kept in a cold place. Milk thus prepared may be expected to keep twenty-four hours, and should preferably be used within that time. The cotton plugs should be kept as dry as possible and should not be removed until the milk is to be used. A covered tin pail

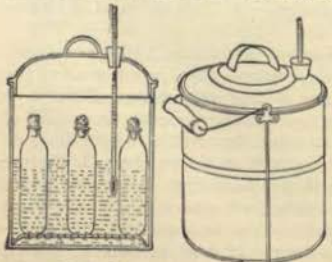


FIG. 4.—Pasteurizing apparatus.

answers well for the larger vessel. An inverted pie pan with perforated bottom can serve as the false bottom. A hole may be punched in the cover of the pail, a cork inserted, and a chemical thermometer put through the cork so that the bulb dips in the water, thus enabling one to watch the temperature closely without removing the cover, or an ordinary dairy thermometer may be used from time to time by removing the lid.

CREAM.

When it is desired to raise cream the milk should be put in a cold place, where it will not be disturbed, as soon as possible after it is received. A good quality of cream for table use can usually be obtained in this way (see Fig. 1, c). It will aid the cream in rising if the temperature of the milk is raised to about one hundred degrees Fahrenheit and then lowered by placing the dish in cold water. This cannot be done unless the milk is in good condition, as the high temperature may cause it to sour before it can cool sufficiently to prevent souring. Milk jars or bottles are now extensively used, and if they are filled when the milk is fresh, and carefully carried, the cream will begin to show in a few hours, and much less time is required for it to reach the top after it has been delivered than when it has been mixed just previous to delivery. Thus by the use of the jars considerable time is saved and fresher cream can be obtained. The jars may be purchased from any dairy supply company at a small cost, and provide a neat, clean way of handling milk.

Separator cream can be made much richer than "gravity" cream, and for this reason is preferred for whipping. It may be kept longer than that raised by gravity, as it can be taken from perfectly fresh milk, while the latter is usually twelve to twenty-four hours old when skimmed. Cream gradually becomes thicker the longer it is kept, and it is often held for this purpose. Sometimes it is one or two weeks old when used; very little is used in as fresh condition as milk. For this reason special care is needed to keep it sweet. Satisfactory results are not obtained by placing it in a refrigerator at a temperature of fifty degrees. It ought to be kept as near the freezing point as possible; it should be placed directly on the ice, or, better yet, be *entirely surrounded* with ice. Good efforts will be wasted if the ice comes up only half way and the top part is exposed to a warm temperature—it must be cold throughout. Skim milk and buttermilk should have the same care as whole milk.

DETECTING IMPURE MILK.

Some of the more common forms of impure milk have already been noted. By pure milk is meant the properly handled product of healthy, well-fed cows. To be legally regarded as pure, in some places, milk must contain at least a certain amount of fat and other solids. It is a difficult thing to determine by the appearance of milk whether it is pure or not, and even experienced dairymen are frequently unable to do this. It has a slightly yellowish-white color, a very slight odor, if any, and should have a distinctly sweet and pure taste. When allowed to stand quietly for several hours, cream should rise naturally, and if the separation is thoroughly effected the cream should form one-eighth to one-fifth of the total volume or bulk. No sediment should appear in the bottom of the jar or vessel. When good milk is poured from a tumbler it should cling to the glass a little, and not run off clean, like water. Skimmed or watered milk is thinner than whole milk, and of a lighter shade, being a bluish-white color. The yellow shade of milk is chiefly due to its fat, but as this constituent is more yellow in the milk of some cows than others, the yellowest milk is not necessarily the richest, and it is unsafe to judge by the color alone; poor milk from some cows may be more highly colored than rich milk from others. Besides this, artificial colors are sometimes added by dishonest persons.

When a volume of milk is to be tested, the first and most important thing to be done is to obtain a fair sample—one that will represent the whole and show its average composition. If the sample is taken from near the top or bottom of a vessel of milk which has been standing quietly for even a short time, it will be too rich or too poor in fat. The milk must be well and thoroughly mixed before the sample is taken. A good way of doing this is to pour it several times from one vessel to another. This should be continued until it is homogeneous and no lumps appear on the surface. If small particles of butter are floating about, a fair sample cannot be taken. There are several methods of testing milk. A complete analysis by a chemist will give the exact amount of each component part. This requires considerable time and expense, and is not necessary for practical purposes.

BABCOCK TEST.

Several methods of rapidly determining the fat content of milk with the aid of chemical reagents have been devised. One

of the most accurate is the Babcock milk test.[1] The little machine constructed to apply this test, and of which several patterns are made, is in use in almost all well-conducted milk-receiving stations. It requires about a tablespoonful of milk for a sample, and the exact percentage of fat in it can be determined by this test in ten or fifteen minutes. The result is obtained by the action of centrifugal force combined with some chemical effects. The original cost of the machine is from three dollars to fifteen dollars, according to size and pattern, and a few cents' worth of materials are used at each operation. Its manipulation is easily learned, and it can be successfully operated by any careful person. A definite amount of the milk or cream to be tested is measured in a pipette and placed in a bottle which has a long, slender, graduated neck (Fig. 7); sulphuric acid is then added, and the bottle shaken until the mixture becomes dark colored, which requires but a few moments.

The bottle is then placed in the machine, by which it is rapidly revolved in a horizontal position with the neck toward the center. The fat is thus forced toward the neck by the other contents of the bottle, which are heavier and therefore thrown away from the center to the bottom of the bottle. Sufficient warm water is added to bring the fat up into the neck, where its exact percentage can be read on the scale. In the illustration a pipette for measuring the milk, the acid measure, and a test bottle are shown. From two to twenty-four bottles, containing as many different samples, can be tested at a time, according to the size of the machine. Special bottles of a modified form are furnished for testing skim milk and cream.

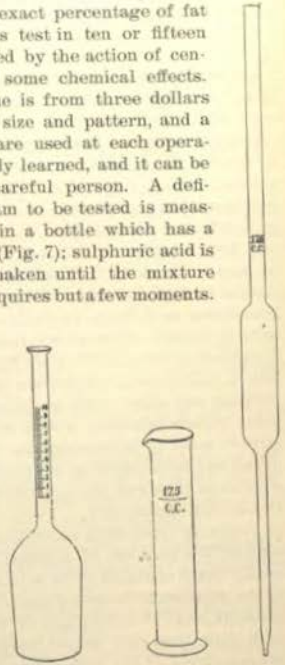


FIG. 7.—Glassware for the Babcock fat test.

[1] Invented by Dr. S. M. Babcock, of the Wisconsin Agricultural Experiment Station, and is used by the Iowa State Dairy Commissioner.

Apparatus for this test is sold by dairy supply firms. A small machine, complete with the necessary glassware and acid, can be obtained for four dollars or five dollars. Full directions are sent with the apparatus. These can be easily followed and quite accurate results obtained after a little practice.

ACID TEST.

Acid commences to form as soon as milk is drawn from the cow, and after a certain amount has been developed it becomes evident to the taste and the milk is said to be sour. It is sometimes desirable to know whether milk is near the souring point or not, or if it is fresh enough for the use of a baby or delicate person; indeed, this may be a matter of considerable importance, and sometimes causes much uneasiness. It is well known that milk which is almost sour will coagulate on boiling, but this test does not show whether the amount of acid present is small or great. Prof. E. H. Farrington, of Wisconsin, has devised a simple method for determining the amount of acid. Tablets containing a definite quantity of alkaline material (such as caustic potash or soda) are dissolved in water and added to a measured amount of the milk to be tested. The tablets contain a little phenolphthalein, which is colorless when in acid solution and pink when in alkaline solution. A solution of these tablets is slowly added to the milk and the mixture is stirred until it becomes pink. It is then known that enough alkali has been added to neutralize the acid in the measured amount of milk and the amount of solution required indicates the acidity of the milk.

Perfectly fresh milk contains very little acid and would turn pink by the addition of a small amount of alkali, while milk nearly sour contains more acid and would require much more of the solution to turn it pink. The tablets are made of such strength that if a solution of two of them turns one ounce of milk pink, that milk should keep a certain length of time with proper care. If the milk remains white after the solution has been added to it, it will probably soon sour. This is a very simple, inexpensive, and useful test, and requires only milk enough to fill an ounce bottle. If this test were adopted for household use one could soon ascertain how much of the alkaline solution would be necessary to turn a definite amount of milk pink, at the time of delivery, and then refuse any not up to the standard.

It has been already stated that colostrum, or the first milk given after calving, contains a large percentage of albumen, and should not be used for ordinary purposes. Albumen is coagulated by heat, and when colostrum is boiled a large coagulum is formed. If perfectly sweet milk coagulates on boiling, the indications are that it contains too much albumen and it should not be used.

The tests referred to above are all good so far as they go, but none of them show whether the milk is from healthy cows or whether it has been contaminated by germs of disease. No test has been devised that will quickly and easily show the presence of disease germs in milk. It was stated above that bacteria get into the milk of healthy cows after it is drawn, and the best way to keep them out is to avoid, as much as possible, exposing the milk to them. This means that the dairy and its surroundings must be clean, and clean all the time. Filth can not be present in any degree without having a contaminating influence.

SELECTION OF DEALER.

Undoubtedly the best way to secure a good milk supply is to deal with a dairyman or milkman who is thoroughly honest and scrupulously clean.

On a well-conducted dairy farm one may expect to find these conditions:

A roomy, clean, dry, light, and well ventilated stable or cow house. To produce good milk, cows must be comfortable, and these conditions not only add to their comfort, but are absolutely necessary to keep them in the best of health.

Healthy and clean cows, which appear well fed and contented.

An abundance of pure water, to which cows are given access at least twice a day.

Feed of good quality; the grain and coarse fodder should be free from dirt, decay, or a musty condition.

A spirit of kindness toward the stock, exhibited by every one employed about them, and gentleness of the animals themselves.

Provision for washing and sterilizing or scalding all utensils which come in contact with milk.

Provision for straining, aërating, and cooling the milk in a clean atmosphere, free from all stable and other odors. This treatment should take place immediately after the milk is drawn from each cow.

Facilities for storing the milk and keeping it cold.

Especially great cleanliness in regard to everything connected with the dairy. The atmosphere of the stable should be pure and free from dust when milking is being done. Employés should carefully wipe the udders and wash their hands before milking, and should be in clean clothes. Whitewash is a good disinfectant, and should be seen in many more stables, and land plaster should be sprinkled about to absorb moisture and odors. The cow should stand on clean litter and not dirty stuff which could be used nowhere else.

If the milk is handled through a store in the city, the building should be kept scrupulously clean, and the room in which the milk is exposed to the atmosphere should be free from dust. There should be provision for keeping the milk cold when stored, and apparatus for steaming or scalding all utensils after they are washed.

CARE OF MILK ON THE FARM.

Whether milk is delivered promptly or held some time before delivery, it needs particular care, and the best dairymen provide for this purpose a room near the stable, but separated from it, so as to exclude dust and unpleasant odors. The milk is taken to the milk room as soon as a pail is filled, poured through a fine strainer, and run over a cooling aërator. This apparatus contains cold water, and the milk passes over the outside in a thin sheet. After twenty or forty quarts have been thus treated a shipping can is filled and set in cold water, or the milk is bottled and kept cold until needed. Some farmers do not use this care, but strain the milk directly into the large can, which stands in any convenient place, usually within the stable. When the can is filled it is placed (as soon as convenient) in a tub of cold water and stirred until partly cooled, then left with the cover ajar until wanted for delivery. Persons handling milk in this way do not appreciate how sensitive the fluid is to foul surroundings, and how quickly it will absorb injurious odors. It is fortunate for consumers that milk shows so plainly when it has been carelessly handled. If purchasers are sufficiently watchful they can avoid being supplied with milk which has been improperly cared for. The dairyman should always bear in mind that milk is a food, and he should not leave it unnecessarily in any place where he would be unwilling to have his own food left an equal length of time.

DELIVERY IN CITIES.

There are as many different ways of delivering milk as there are of producing it, and not an insignificant part of the trouble which it gives is caused by neglect to properly care for it while being delivered. The large wide-mouthed cans which are opened from fifty to a hundred times before they are emptied have their contents thus exposed to considerable dust and dirt. These cans are often carried without ice, even in the warmest weather, and milk cannot possibly remain long in good condition when so treated. An improvement over this method is to have a faucet near the bottom of the can and an arrangement to stir the contents, so that milk of uniform quality can be drawn without exposing the entire supply. In warm weather the cans should be covered with ice or ice water, or at least with a wet blanket, which is some protection.

Fig. 8.—Milk jar.

The cleanest and most satisfactory way of delivering milk is in glass jars or bottles (Fig. 8). Every person who is served in this way should be certain that the jars are properly cleaned as soon as emptied, and the dealer should clean and sterilize them as soon as they are collected each day. Bottles are easily cleaned, each one is a measure and prevents over or under measuring, and each bottle of milk is known to contain all the cream belonging to it. Bottles do not hide dirt in the milk, and if they are filled with fresh milk and are allowed to stand quietly a few hours cream will usually show at the time of delivery. They save milk from being unnecessarily exposed, and if they are filled in the country the milk does not come in contact with city air until it is in the house of the consumer. This matter is of considerable importance, as it has been shown that bacteria are very abundant in the atmosphere of cities, while in clean country districts but few are found in the air. The use of sealed bottles decreases the opportunity for adulteration. Some companies serving a high-class trade with milk, for which special claims of purity are made, seal the jars, as soon as they are filled, with paper labels on which the time of milking is stamped, and these must be broken before the jar can be opened. A seal like the following is sometimes used:

M—— Farm Milk Co.
Mar. 3, 6 a. m.
Refuse a broken seal.

This is placed over the stopper and the two ends pasted or otherwise fastened to the sides of the jar. It is an excellent plan, and practically removes all chances of the milk being tampered with by driver or servant, and places all the responsibility on the one who bottles the milk; yet this is not effective unless the seal is so prepared and guarded as to prevent its being removed and replaced or counterfeited.

THE COMPOSITION AND INFECTIOUSNESS OF MILK.*

When I determined, upon the invitation of your Secretary, to present a paper at this meeting of the Association, I concluded that I would submit to you some observations upon "Animal Food," in general. However, as I began to investigate the subject, a field so wide, extensive and inviting opened up that I feared to enter, lest in roaming through the highways and byways, and reveling in its attractions and incidents, I should become prodigal of your time, and weary you with much speaking. Hence I have selected as the subject of my paper, "The Composition and Infectiousness of Milk," believing that this one item of animal food will afford an opportunity to present within reasonable time some facts, which, though not new to most of you, are worthy of being twice told. Indeed, the subject is of so much importance, and enters so much into our daily life, and is so universal in its application, that it cannot be too often nor too prominently brought before the public.

For the purposes of this article, cows' milk alone will be considered, since no other kind of milk is used by many infants and adults; and since it is the most universal, and, under proper conditions, the best substitute for human milk in the feeding of children.

Cows' milk, according to Cameron, is composed of the following parts per one million:

Water		870,000
Fat	40,000	
Casein	41,000	
Sugar	42,000	
Salts	6,200	130,000
		1,000,000

* By J. F. Kennedy, A. M., M. D. Read before the American Public Health Association at Buffalo, New York, September 15, 1896.

It also contains gases in solution in the following proportions, in thirty parts per one thousand in volume:

Oxygen	$1\frac{28}{100}$
Nitrogen	$12\frac{17}{100}$
Carbolic acid	$16\frac{54}{100}$

It will thus be seen that pure, uncontaminated cows' milk contains, in practically proper proportions, all the elements of a perfect food. Human milk, its closest analogue, is the only food prepared by nature for the most critical period of human life, and for nine to twelve months all the marvelous developments of infancy are best promoted by the sole use of breast milk.

In adults, milk alone will sustain life longer than any known food. Drs. Coplin and Bevan, in their excellent "Manual of Practical Hygiene," say: "The writers are aware of a patient who lived three years upon three to five pints of milk daily, and a patient in the hospital of the Jefferson Medical College, suffering from carcinoma of the gullet, received three pints of milk daily, and gained considerable weight and strength during the period of thirteen months."

The quantity of milk used in the United States annually, either in its original form, or its products, butter and cheese, is enormous, and attests its importance as an article of food. Especially is it important because of the large number of infants who are artificially fed, and whose sole dependence for life itself is upon milk.

It is said that during the year 1895, in England and Wales, one-fifth of the total deaths were children under one year old, and it has been shown that of this frightful mortality, much the greater proportion were artificially fed children.

In Berlin, in giving the certificates of death of children under one year, the fact must be stated as to whether the child was fed from the breast or brought up artificially. In ten thousand deaths thus reported, it was found that two-thirds, or seven thousand six hundred and forty-six, were artificially fed.

Hope, in a series of investigations in England, discovered that only three per cent of one thousand deaths occurred in infants that were breast-fed; and Minert, of Bavaria, found in a similar investigation, that out of four hundred deaths of children from summer diarrhœa that came under his notice, ninety-six per cent were fed artificially.

In view of these facts it is pertinent, therefore, to inquire whence come such direful results from the use of an article of food so well adapted by nature, in its normal condition, to the growth and development of the body?

The cause of quite a large number of deaths of these children artificially fed is inanition, the milk having been largely deprived of its nutritious properties by the addition of water—in many cases commercial milk being diluted from twenty-five to thirty per cent.

This dilution is not only a fraud upon the buyer, but a great crime perpetrated upon the innocent child, who needs the milk, with its rich per cent of butter-fat, as secreted by the udder, in order that it may grow and develop. If deprived of this essential element, instead of thus growing, the muscles become flaccid, the features haggard and pale, and finally literal starvation occurs.

Many States now have dairy laws which are intended to protect the people against this fraud of adulteration, and in some places the law is measurably successful. Even where there is a rigid and apparently efficient inspection of milk, however, and the butter-fat is up to the per cent prescribed, the inspection is not expected to reach further. The commercial, rather than the sanitary, interests of the consumer are guarded.

The design of this paper is to emphasize and intensify the importance of a sanitary inspection in addition to, if not to the exclusion of, the mere commercial examination. Indeed, a faithful sanitary inspection must of necessity exclude all adulterants, whether for the purpose of increasing the bulk, or changing the quality of the milk.

But little effort has yet been made to determine the condition of the cattle giving the milk, whether healthy and free from any infectious disease; to examine the feed and water given the cows; the sanitary condition of the stables; the character of the water used for washing the cans, if not for diluting the milk; the sanitary condition of the milkmen's family, and whether they have any infectious diseases; and the habits of those handling the milk, and the methods used in milking. All these are important conditions, which contribute greatly to the healthfulness or infectiousness of the milk.

The first thing of importance is to determine whether the animal furnishing the milk is healthy or not. If a corrupt

fountain cannot send forth pure water, neither can a diseased cow secrete and furnish pure and wholesome milk.

An interesting report prepared by S. C. Busey, M. D., and G. M. Kober, M. D., of Washington, D. C., has recently been published by the Health Officer of the District of Columbia, for 1895, on "Morbific and Infectious Milk." The authors point out certain diseases of cows that affect the milk deleteriously, if not dangerously. Among those diseases which render the milk unfit for food, they cite the following affections: Garget and inflammatory condition of the udder and teats; gastro-enteric diseases; acute specific enteritis; puerperal and other septic fevers; foot and mouth disease; cowpox; anthrax; pleuro-pneumonia; rabies; tetanus, and tuberculosis.

They proceed in their report to furnish ample proof of the infectious character of milk from cows affected with the foregoing diseases, and show that often loathsome and fatal sickness has arisen because of the use of milk thus infected.

It is said that about one-seventh of all the deaths occurring in the world are from tuberculosis, and as it has been universally conceded that tuberculosis in man and cattle is identical, it is important to know to what extent this disease prevails among cattle.

It is fair to assume that it is much more frequent than is believed. Avarice and commercial greed combine to secrete and minify the prevalence of the disease, and to weaken or prevent belief in the infectiousness of the milk and meat of such animals.

Despite this disposition to conceal the extent to which this disease prevails, veterinarians and commissions are diligently and successfully turning on the search light of investigation, and already some interesting facts have been discovered.

Fleming says: "Tubercular phthisis, or tuberculosis, probably prevails among domesticated animals over the entire globe, though its frequency will depend upon various external influences, as well as the constitutional tendencies, of different species and breeds. In some countries it is enzootic and very destructive. In Mexico, for instance, it is very common, and causes much loss — about thirty-four per cent of the animals slaughtered for food being found affected."

In France, M. Arloing estimates that among the adult bovine animals five out of every one thousand are tuberculous. The

proportion in England, according to Mr. Cope, is from one to twenty-six per cent, depending upon the locality.

In Belgium the estimate is four per cent.

In Holland, the proportion given varies from 8⅛ to 10⅝ per thousand.

Dr. Winchester reported to the Massachusetts Cattle Commission that during 1887 and 1888 he had learned of thirty-four herds of cattle in which tuberculosis was actually demonstrated by post-mortem examinations. These herds contained eight hundred and sixty-six cattle. Of these two hundred and forty-three, or twenty-eight per cent, were pronounced tuberculous, and upon being killed were found to be diseased. In fifteen other herds there were two hundred and forty-four head. Twenty-eight of these showed marked symptoms of tuberculosis, and twenty-four more were suspected. Post-mortems, however, were not obtained. Thus in these forty-nine herds, consisting in all of one thousand one hundred and ten animals, two hundred and seventy-one were reported as tuberculous and two hundred and thirteen as suspicious.

Later reports and more extensive examinations increase rather than diminish the per cent of tuberculous animals.

Dr. Harold C. Ernst, in his report to the Massachusetts Society for the Promotion of Agriculture, published in 1895, in which he tabulated the replies given to a series of questions, gives the following summary:

In the practice of thirty-nine veterinarians, representing seventeen States, most of them reporting for one year only, there occurred five hundred and forty-nine cases of tuberculosis and two hundred and forty-two suspicious cases, a total of seven hundred and forty-nine among one hundred and sixty-five herds, containing in round numbers three thousand animals. Thus, in the herds where tuberculosis existed, about eighteen per cent were diseased, and over eight per cent suspicious, a total of about twenty-six per cent.

It is proper to state here, that while tuberculosis is so prevalent and so widespread, the number of cattle affected with the other diseases named is comparatively small.

Having shown the extent to which tuberculosis exists, it is pertinent to inquire as to the danger of using milk from animals thus diseased. Nor is there an abundance of evidence wanting on this point.

Dr. Ernst, in obtaining data for his report above referred to, made an effort to obtain, so far as possible, clinical reports

of cases of transmission of tuberculosis through milk from mother to offspring. In order to secure reports from the most reliable, as well as most probable sources of information, he addressed a letter to eighteen hundred physicians and veterinarians, selecting the former from the membership of the Massachusetts Medical Society of at least five years' standing, from the American Surgical Association, from the American Medical Association and from one or two other special societies of the country. The names of the latter were taken from the rolls of the United States Veterinary Association, and included those who were thought to have had enough experience to make their observations of possible value in this direction.

The direct question asked was: "Have you ever seen a case of tuberculosis which it seemed possible to you to trace to a milk supply as a cause?"

After receiving replies from the majority of those thus interrogated, he concludes his report as to the infectiousness of milk as follows:

"I. While the transmission of tuberculosis by milk is, probably, not the most important means by which the disease is propagated, it is something to be guarded against most carefully.

"II. The possibility of milk from tuberculous udders containing the infectious element is undeniable.

"III. With the evidence here presented it is equally undeniable that milk from diseased cows, with no appreciable lesion of the udder, may, and not infrequently does, contain the bacillus of the disease.

"IV. Therefore, all such milk should be condemned for food."

It is a well settled fact that milk in the udder of a healthy cow is normal and free from all micro-organisms, and that it is only after leaving the udder that these organisms make their appearance.

It has been an interesting question, and the occasion of careful and painstaking observation and experimentation, as to whether the milk as it comes from the udder of a tuberculous, or otherwise diseased cow, is so affected by her diseased condition as to produce the same or a similar disease in other animals (including the human) by using it; or whether the contraction of tuberculosis following the use of such milk is the result of the introduction of the tubercle bacillus during and after the process of milking.

The opportunities to determine this point must be rather few. So soon as the milk leaves the teat it is liable to infection in numerous ways, and even the calf receiving the milk directly into its mouth from the udder may get the infection from the external surface of the teat by germ-laden dust, or other adherent particles. Experiments that have been made in which all known or possible sources of infection were eliminated, seem to prove conclusively that the milk of a tuberculous cow, even before it leaves the udder, as well as the meat of the animal, is infectious in character, unsafe and unfit for food. This applies to cows in which there is no appreciable lesion of the udder, and is a refutation of the opinion so generally prevailing that only cows having tuberculous udders are capable of reproducing the bacillus in the milk.

At the Iowa Agricultural College Experiment Station, as a result of observations and experiments by Drs. Stalker and Niles, it was found that calves from healthy mothers that were at birth put with tuberculous animals to be raised, in a few months developed tuberculosis, while calves dropped from tuberculous animals and brought up by healthy cows showed no sign of the disease at all, grew well, were sleek, took on fat, and when killed later showed none of the characteristic lesions of tuberculosis, thus showing that so far as these experiments indicated, tuberculosis was not hereditary, and that the milk from tuberculous cows produced the disease in calves born of healthy animals.

Prof. James Law, in his very able paper on "Tuberculosis in Relation to Animal Industry and Public Health," dwells upon this point at considerable length. Coming from a source so eminent, his conclusions are entitled to and have received generous consideration and implicit confidence.

After considering the danger of the transmission of tuberculosis by the blood and meat of tuberculous animals, he proceeds to the consideration of the "danger from milk," and says:

"Milk is more to be dreaded than meat, because the udder is often the seat of tuberculosis, and the milk is usually taken uncooked. The danger is enhanced by the fact that this is often the necessary and only food of the infant and invalid, in which the germ is especially liable, through weak and imperfect digestion, to escape into the susceptible bowel.

"In milk, as in the case of meat, a strong and vigorous digestion does in some measure protect the consumer.

Peuch fed a two-months-old pig in five days four and one-half quarts of milk drawn from a tuberculous udder, and killed in fifty-six days, it proved quite sound. He inoculated four rabbits with the milk, and all four became tuberculous. Again, in the absence of tuberculosis in the udder, the milk may be little, if at all, infecting. Gerlach, who produced tuberculosis in calves, pigs and rabbits by feeding the milk, found no results from certain tuberculous cows, while others infected a large proportion. Nocard and McFadyean have been unable to infect rabbits, etc., with milk from an apparently sound udder of a tuberculous cow. The same has been my experience with milk from one cow in the last stages of chronic tuberculosis, and another having acute tuberculosis. Bollinger, Nocard and McFaydean claim that in the absence of tubercle in the udder the milk is not infecting. Whether true or not, as an ultimate fact this cannot be made a rule of action, as the following will show:

"Hirschberger inoculated rabbits in the abdominal cavity with the milk of twenty-nine tuberculous cows, of which the udders were or appeared sound, and produced tuberculosis fourteen times.

"Bang inoculated from sixty-three cows selected for their sound udders, and found the milk of nine of them infecting. A careful microscopic examination revealed tuberculosis in the udders of three of the cows, leaving six giving infecting milk, in which, even after death and with all scientific appliances, no tubercule could be found in the udder. This is 9⅓ per cent, as tested by the microscope after death; it was 14⅔ per cent, as tested by the able veterinary professor during the life of the cow.

"Ernst found ten cows in thirty-five with infecting milk, though the udders were sound. In one hundred and three animals inoculated, seventeen contracted tuberculosis, and of twelve calves sucking the cows, five became tuberculous.

"Drs. Smith and Kilbourne (Bureau of Animal Industry, Bulletin No. 3) found the milk infecting in three cows out of six with apparently sound udders. One infecting cow and one non-infecting one had each tubercle in the lymphatic gland behind the udder. Forty-four per cent of the inoculated guinea pigs contracted tuberculosis; one in five from one cow, eight in ten from another and six in six from a third.

"In my own experience, three calves from healthy parents

sucking the apparently sound udders of three cows with general tuberculosis, all contracted the disease.

"It must be allowed that calves sucking the cows run extra risk of infection through their nurses licking them, and through feeding from a common trough, but there is the same danger for the ordinary milk consumer, since the cow in licking her udder is liable to leave baccilli to fall into the pail at the next milking.

"Again, the concentration of the bacillus in the undiluted milk of an infecting cow renders this much more dangerous than the milk of the same cow diluted with that of twenty, fifty or one hundred others.

"Bolinger and Gebhardt found that milk which infected all animals which took it pure was apparently harmless when diluted with fifty or one hundred times its volume of the milk of sound cows. As the bacillus can live in milk this apparent loss of virulence must be largely due to the reduction of the number of bacilli in a given measure of milk, and to their tendency to removal by adhering to the sides of the vessel during the mixing.

"Tuberculous expectoration, which is incomparably richer in bacilli, may be diluted with one thousand times its volume of water and yet remain infecting. But again, the glutinous saliva forms a protecting coating which strongly resists dilution.

"Instances of accidental tuberculosis of the human being through drinking the unsterilized milk are no longer wanting.

"In the practice of Dr. Amorback a well developed five-year-old boy, from sound parents, whose ancestors on both male and female sides were free from hereditary taint, succumbed after a few weeks' illness with acute miliary tuberculosis of the lungs and enormous enlarged mesenteric glands. A short time before the family had their family cow killed and found her the victim of advanced pulmonary tuberculosis. (Lydtin.)

"Dr. Demme records the case of four infants in the Child's Hospital at Berne, the issue of sound parents without any tuberculous ancestry, that died of intestinal and mesenteric tuberculosis, as the result of feeding on the unsterilized milk of tuberculous cows. These were the only cases in which he was able to exclude the possibility of other causes for the disease, but in those he was satisfied that the milk alone was to blame.

"After a lecture of the author's at Providence, R. I., a gentleman of North Hadley, Mass., a graduate of the Massachusetts Agricultural College, publicly stated that his only child, a strong, vigorous boy of one and one-half years, went to an uncle's for one week, and drank the milk of a cow which was shortly after condemned and killed in a state of generalized tuberculosis. In six weeks the child was noticeably falling off, and in three months he died, a mere skeleton, with tuberculosis of the abdomen. The father could trace no tuberculosis among his near ancestors, but the mother's father and uncle had both died of it. She remains in excellent health."

"Dr. E. O. Shakespeare (*Med. News*, March 26, 1892), attributes one-fifth of all deaths of infants and young children feeding on milk to tuberculosis, usually commencing in some part of the digestive organs."

In June, 1896, Drs. Sidney Martin and Gins Woodhead, and Professor McFadyean, of the Royal Commission of England, who were appointed to make special inquiries as to the effect of food derived from tuberculous animals, made their report. The report of Dr. Martin, who is exceedingly conservative, is of special value, because of the positive results he obtained with regard to the infectivity of milk from tuberculous cows. He says: "The milk from cows with tuberculosis of the udder possesses a virulence which can only be described as extraordinary."

He recommends as a practical measure that the milk from all cows in which one or more quarters of the udder are enlarged or nodulated, or in which the milk from one or more quarters fails either in quality or quantity, should be at once excluded, and the cows examined by an expert. He further declares that every tuberculous cow must be looked upon with suspicion, for, although the presence of tuberculosis of the internal organs, in his opinion, does not confer infectivity on the milk, yet tuberculosis may develop in the udder at any stage of the general disease.

Dr. Woodhead, by his experiments and observations, arrives at the conclusion that in children at least, general tuberculosis infection is in very many cases to be traced to the ingestion of infected milk—that is, it is not necessary that a local lesion of the alimentary canal should be produced. The tubercle bacillus may run the gauntlet of the lymphoid tissue of the intestines and pharynx to establish itself in the mesenteric or the cervical,

and finally the tracheo-bronchial glands, from which, by a process of extension or secondary infection, tuberculosis of the peritoneum, the lungs, or a generalized tuberculosis, may ensue.

Prof. M. Stalker, of the veterinary department of Iowa Agricultural College, who has been making extensive investigations of this subject, reports two cases which came under his observation. One case was where five young people between the ages of twenty and thirty years, died of consumption in one family during a period of two years. No trace of the disease had ever been known in the family of either the father or mother of the victims. On the farm where the deaths occurred he found seventeen cases of tuberculosis in the herd of cattle, and others had died before the investigation was made.

Another case was in connection with a diseased herd of cows that was under test. A mother and child died; the mother from undoubted consumption, the child from intestinal trouble highly suggestive of the same disease. The cow that had supplied milk to the mother and child was tested and found to be tuberculous. Post-mortem examination of the cow revealed a badly tuberculous condition of the udder.

Enough has already been said to convince the most skeptical that there is great danger of infection from the use of milk from diseased animals, especially from tuberculosis.

Unfortunately the only infected and dangerous milk is not from tuberculous cows. It is well known that the best milk — milk from cows in which there is not a taint of disease, after leaving the cow becomes infected. It will be readily conceded that the most of the cases of disease arising from the use of infected milk, occur where the milk has been from healthy cows, and into which the pathogenic germs were introduced after leaving the cow. The extensive epidemics of infectious disease produced by the use of infected milk arise in this manner.

Drs. Busey and Kober, above referred to, in noticing some instances of milk that had acquired infective properties only after it had left the udder of the cow, say:

"Numerous instances have been observed in which outbreaks of typhoid fever, scarlet fever and diphtheria, by their sudden and explosive character, affecting families living in streets or localities, visited by the same milkman, naturally pointed to the milk supply as a common cause; but to Dr. Michael Taylor belongs the honor of being first to point out definitely that cows' milk might serve as a medium of spreading typhoid

fever from a dairy where the disease prevailed. In 1867, Dr. Taylor also showed that scarlet fever might be distributed in the same way. In 1877, Mr. Jacob traced a diphtheria epidemic at Sutton to milk supply, and in 1872 Macnamera traced an epidemic of cholera at Calcutta to an infected dairy."

These facts could not fail to invite criticism and sharpen the power of observation in others, and in consequence similar outbreaks were more frequently reported, so that Mr. Ernest Hart in a most valuable paper was enabled to present to the International Medical Congress, held in London, 1881, the history of fifty outbreaks of typhoid fever, fifteen of scarlet fever and seven of diphtheria, all traceable to the milk supply; but even this formidable display of facts was not accepted as conclusive, largely because the milk industry constitutes a strong spoke in the commercial wheel, and naturally opposed what they considered meddlesome interference with their trade, and in many instances were upheld by members of our profession, who considered the evidence wholly circumstantial and incomplete as long as the specific germ of the respective diseases had not been demonstated in the suspected milk. * * * An approach in this direction worthy of emulation has been made by Professor Vaughan before the Congresss of Demography, in London, August, 1891, when he declared:

"Milk has been frequently diluted with water containing germs of typhoid fever, and the prevalence of the disease may mark the daily rounds of the milkman. I have here a culture tube containing a bacillus which I found simultaneously in the water from the dairy well, and in the milk from the cans. At the same time one or more cases of typhoid fever existed in every family which patronized this milkman. The bacillus resembles, but is not identical with, that of Eberth."

They further, in their report of epidemics of typhoid fever, scarlet fever and diphtheria, say:

"Mr. E. Hart tabulated fifty epidemics of typhoid fever, and we have collected eighty-eight, making a total of one hundred and thirty-eight epidemics traceable to a specific pollution of the milk, the main facts of which are presented in a subjoined table. In one hundred and nine instances there is evidence of the disease having prevailed at the farm or dairy. In fifty-four epidemics the poison reached the milk by soakage of the germs into the well water with which the utensils were washed, and in fourteen of these instances the intentional dilution with

polluted water is admitted. In six instances the infection is attributed to the cows drinking or wading in sewerage-polluted water. In three instances the infection was spread in ice cream prepared in infected premises. In twenty-one instances the dairy employés also acted as nurses. In six instances the patients, while suffering from a mild attack of enteric fever, or during the first week or ten days of their illness, continued at work, and those of us who are familiar with the personal habits of the average dairy boy will have no difficulty in surmising the manner of direct digital infection. In one instance the milk tins were washed with the same dishcloth used among fever patients. In this instance the disease was attributed to an abscess of the udder (?), in another to teat eruption (?), and in still another to a febrile disorder (?) in the cows. In four instances the disease was spread through the medium of creameries, and in one instance the milk had been kept in the sick room.

"Mr. Hart collected statistics of fifteen epidemics of milk scarlet fever, and we have tabulated fifty-nine, making a total of seventy-four epidemics spread through the medium of milk supply (?).

"In forty-one instances the disease prevailed either at the milk farm or dairy. In six instances persons connected with the dairy either lodged in or had visited infected houses. In another instance the milkman had taken his can into an infected house. In twenty instances the infection was attributed to disease among the milch cows; in four of these the puerperal condition of the animal is blamed. In nine instances disease of the udder or teats was found. In one instance the veterinarian diagnosed a case of bovine tuberculosis. In six instances there was loss of hair and casting of the skin of the animal. In another instance the cattle were found to be suffering more or less from febrile disturbance. In ten instances the infection was conveyed by persons connected with the milk business, while suffering or recovering from an attack of the disease, and in at least eight cases by persons who acted as nurses. In three instances the milk had been kept in the cottage close to the sick room. In another instance the cows were milked into an open tin can, which was carried across an open yard past an infected house; and in another instance, the milkman had wiped his cans with white flannel cloths (presumably infected), which had been left in his barn by a peddler. Two epidemics

appear to have been instances of mixed infection of scarlet fever and diphtheria.

"He also collected statistics of seven epidemics of milk diphtheria, and we have added twenty-one more. In ten of these twenty-eight instances, diphtheria existed at the farm or dairy, and in ten instances the disease is attributed directly to the cows having garget, chapped and ulcerative affections of the teats and udder, while in one instance the cows were apparently healthy, but the calves had diarrhœa. In another instance one of the dairy maids suffered from a sore throat of an erysipelatous character; in another the patient continued to milk while suffering from diphtheria; and in still another, one of the drivers of the dairy wagons was suffering from a sore throat.

"It is interesting to note that of one hundred and thirty-eight epidemics of milk typhoid, seventy-four of scarlet fever and twenty-eight of diphtheria, a total of two hundred and forty epidemics, one hundred and eighty-seven have been recorded by English authors, thirty-one by American, and nine by Scandinavian; eight came from Germany, three from Australia, and one each from French and Swiss sources.

"Whether this is due to the fact that on the continent of Europe milk is rarely used in a raw state, or whether it is simply an index of the greater interest taken in England and the United States in preventive medicine, remains to be determined."

Three or four instances of epidemics of typhoid fever occurring in this country from the use of infected milk will be given somewhat in detail, in order not only to demonstrate that such outbreaks do occur, but to also illustrate the necessity for and the success attainable by intelligent and faithful investigation.

In June, 1890, the Connecticut State Board of Health was requested to investigate an outbreak of typhoid fever at Waterbury. Attention was first directed to the water supply and drainage, which were found not to be the cause. There were thirty-five house invasions, with fifty cases. Of these, twenty-six houses, with forty-one cases, it was discovered, were supplied with milk from the same milkman; that this milkman secured his milk from several farms; that the invasion followed the route of milk from a certain one of these farms. An investigation was made at this farm, and it was found that the farmer, his daughter and a farm hand had been sick with typhoid fever.

The excreta of the sick were thrown upon the barnyard; the hired man defecated, so long as able to be about, in the cow stables. The barnyard was in a bad condition. The milk was handled in a shed attached to the barn. In fair weather the milk cans were washed outside the shed; on rainy days, inside the shed. A door opened from the shed into the cow stables on one side, and another door into the barnyard. In the yard was a tank in which the milk cans were placed to cool. The can lids were tilted so as to admit the air. There could be no question as to the source of the infection of the milk. The water used was from a spring, and free from the typhoid bacillus. The material of the barnyard was infected, and the conditions were favorable for extensive multiplication. It was tracked into the milk room by the men, and there drying into dust, was carried by air currents into the milk.

Among the cases in this invasion was one of a person who did not use the milk. But it was found that two weeks prior, ice cream had been eaten, and that the milk came from the infected farm, thus confirming the work of Pruden and others, that typhoid bacilli retain their vitality for months frozen in blocks of ice. The milk supply from this farm was stopped, and the disease subsided.

In August, 1892, an epidemic of typhoid fever appeared in a particular portion of the city of Springfield, Mass., a detailed account of which is given in the report of the State Board of Health. The people, as well as the physicians, were perplexed, and various theories were put forth as to the source of infection, for it was in the best part of the city, where the environments apparently precluded the usually accepted sources. First, the water of certain wells was suspected, but investigation showed that most of the infected families used water from the city waterworks, which was uncontaminated. The drainage was suspected, but it was shown that the houses were mostly new and the plumbing good. The sewer was suspected, but families living nearest the manholes of the sewers were unaffected. The cemetery was also suspected, but it was found that a well in the cemetery contained less ammonia than wells in the typhoid district, where the disease was most prevalent. The theory of ice infection was also tested and exploded. It was finally discovered that all the infected families were supplied with milk from one man; that in the most infected portion one family was exempt entirely from the disease, and this family received milk from another milkman.

On investigation of the farm of the milkman, it was found that early in the Spring the milkman's daughter was sick with so-called "bilious typhoid fever." Others of the family were also sick with a "slow fever." The excreta of the patients were thrown into a privy vault, and the contents of the vault were subsequently thrown upon a tobacco field. Near by was a well not used for drinking purposes. Into this well the milkman lowered his cans of milk, letting them sink to the bottom, to remain until they were taken away to supply his route. In the well was an old chain pump. Over the well were loose planks. The men in wet weather tramped over the tobacco field, through the cow yards and then to the well. The planks over the well were filthy with mud, and careless pumping washed the mud and filth into it. The water was dirty, and was found to contain *baccilli coli communis* to an enormous extent. Nine milk cans were lifted from the well. They were stopped with wooden stoppers. On tipping the cans milk ran out around the stoppers. This being true, the water of the well would run in None of the cans were full. The facts, as developed in this investigation, left no room for doubt or question as to the source of the epidemic, wherein there were one hundred and fifty cases, with twenty-five deaths. Of the one hundred and fifty cases, one hundred and one had milk from the same man, and one hundred and thirty-five had access to the same milk.

In October, 1894, the Secretary of the Board of Health of Titusville, Pa., found three cases of typhoid fever on a farm. From this farm milk was taken to the city. Within four weeks there were fifty cases of typhoid fever, all in families who had been using milk from this farm. The first case on the dairy farm was brought from this city, Buffalo. The mother took care of the sick and the milk at the same time.

In April, 1895, a serious outbreak of typhoid fever occurred in the city of Stamford, Conn. It was so sudden and widespread that Dr. Lindsley, Secretary of the State Board of Health, was called to make an investigation as to the cause and to assist in suppressing it. He reports that attention was first given to the water supply, but that was soon abandoned. So, also the food supply. It was soon discovered that sickness followed exactly the route of a certain milkman. In various parts of the city there were three hundred and eighty-six cases, of which three hundred and seventy-six were persons who used

milk from this milkman; while in houses contiguous, where milk from another source was used, there were no cases. There were twenty-five deaths. The appearance of the disease was simultaneous over the district. So soon as the source of infection was discovered the milk supply from this man was stopped, and the disease at once subsided. Investigation of the premises of the milkman revealed the fact that he washed his milk cans with water from a well which chemically showed contamination by sewage. Pruden discovered six thousand six hundred and ninety living bacteria in a single cubic centimeter of the water.

The water in the well was only one foot and nine inches below the surface, and overflowed in the Spring, and surface drainage was toward the well. A shallow privy vault, leaking at the surface, was twenty-five feet distant, and free of access to a walking case of typhoid fever. The conclusion was irresistible that the source of this outbreak was milk, and the source of infection of the milk was the water from this well, contaminated by drainage from this privy.

The foregoing is sufficient to establish the fact that milk from infectious animals, especially from tuberculous animals, and that also from healthy animals when infected by disease germs, is dangerous, and leads to a very brief consideration of the sources of infection and the remedy.

It is not necessary, as it would not be profitable, were it possible to note in detail all the physiological or pathological processes by which the milk of a tuberculous cow is changed in the udder from a healthful and nutritious product into one carrying disease and death to those who use it. We only know that such has been demonstrated to be the fact.

I have pointed out, in the instances above given, some of the methods by which milk, after it leaves the udder, becomes infectious.

While milk in the healthy cow's udder is free from bacteria, it is well known that the milk of commerce, especially as found in the cities, is swarming with these micro-organisms.

Fortunately few of these bacteria are harmful, and many are useful, if not essential.

While, therefore, milk is favorable to the growth and development of so many harmless germs, it is also favorable for the propagation of pathogenic germs.

The following are some of the methods by which these germs, beneficent and malevolent, gain access to the milk outside of the udder:

1. By the process of milking itself. Particles of dirt from the hands of the milker, from the teats and udder, and from the sides of the cow fall into the pail. The pail itself may have been washed with impure water, and been imperfectly dried; or the germs may have been floating in the air and settled in the bucket before, during or after the milking.

2. The stables may have been in a filthy condition, and the cows lying in the filth and having it adherent to their udders, drop it into the pail.

3. The hands of the milker are often moistened with the milk to contribute greater ease and facility to the process of milking, and the drops of the milk thus used and laden with impurities, if not with filth, get into the milk.

4. Then, it often happens in many ways that the milk after it leaves the dairy is infected by the addition of water, or by varying changes of temperature, especially a higher temperature, which greatly favors the rapid multiplication of the bacteria.

5. Even if the milk has reached the consumer in good condition, it may become infected because of the filthy or careless habits of the inmates, or by the presence of infectious diseases in the family.

6. It has been found in several instances that milk was infected in the dairy because of sickness in the home of the proprietor or some of the milkmen.

Is it any wonder, then, that milk should be rendered infectious? Is it not rather a miracle that the mortality from its use is not greatly multiplied? The only remedy is suggested by the causes above enumerated, and may be summed up under three heads—inspection, cleanliness and sterilization.

All dairy cattle should be carefully inspected by a competent veterinarian, with a view to determining the presence of tuberculosis, and all diseased or suspected animals should be condemned. The habits of dairymen, with respect to cleanliness, the barns, the water supply, should all be known and recorded.

The sale of milk from dairies or private families where infectious diseases exist should be prohibited.

The strictest cleanliness of animals, persons and surroundings should be enjoined and enforced; and the almost certainty

of infection from the lack of cleanliness, as well as the terrible results so often following the use of milk so infected, should be taught in every home and school.

But with all this teaching and the most rigid inspection there will be vast quantities of dangerous milk sold and used, and sickness and death ensue in consequence, unless those receiving the milk resort to sterilization.

To "sterilize" milk the temperature should be raised to the boiling point, and kept there for a few minutes. It has been suggested that a few spores will at this temperature perhaps not be destroyed, and their presence will sooner or later cause the milk to sour; hence the milk should be subjected to two hundred and twenty degrees heat.

Both Pasteurization and the raising of the temperature to two hundred and twenty degrees require the use of a thermometer—an instrument that is kept in comparatively few homes, and when kept is far from being reliable. Hence I recommend as the best, because the simplest and most reliable method, the boiling of the milk. The best way is to place the milk in bottles tightly corked, and boil them while immersed in water. The bottles should only be filled within about two inches from the cork, so as to allow for the expansion of the milk. After boiling, the bottles should be left in the water until it is cool, as their removal while hot will break the bottles. With this process that can be practiced in any home and by anybody who can tell when water is boiling, there will be absolutely no danger from disease germs, and milk may be kept for some days, especially in a cool place, without becoming sour or altered in any way.

Milk in larger quantities may be sterilized by being placed in tightly covered pails or cans, and boiled in a kettle or boiler containing water.

Professor Jacobi, of New York, one of the highest authorities we have on infant feeding, etc., says: "Virtually sterilization" (by boiling) "has been practiced by me more than forty years, and has been taught by me these thirty-five years, both in lectures and in books and essays. I have always urged that safety increased with the number of boilings."

"There are many expensive and ingenious contrivances for sterilizing milk, but I believe the above simple methods are not only practical and economical, but reliable."

From the standpoint of public sanitation, therefore, the production, handling, and sale of milk should be regulated and

controlled by the health authorities. The intervention of the present State law is only commercial. It has no relation to the public health. This intervention should begin at the dairy and continue until the consumer is reached; for, while the dairy farm is the chief source of infection, various other places for the reception and distribution of milk are also dangerous. This intervention can best be provided by a system of inspection and license, and all milk from unlicensed producers and vendors should be prohibited from sale or distribution within the limits of a city or town.

It is with pleasure the opportunity, here presented, is embraced to commend in the highest terms, the efficient effort of the State Dairy Commissioner to elevate and improve not only the dairy herds and creamery products of the State, but the milk supply of cities and towns as well. As to the latter, he has been an earnest, indefatigable co-worker with the State Board.

FLOUR--WHITE VS. DARK.

There is an ever increasing interest among writers and experimenters respecting the comparative food value of white flour and brown flour. For an intelligent conclusion as to this value it is necessary to know the constituent parts of wheat.

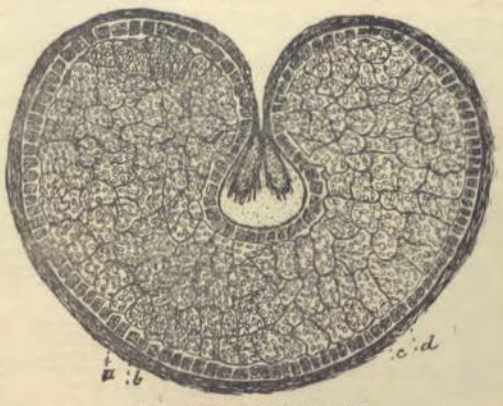


Fig 1.—Wheat grain highly magnified.

WHEAT—WHAT IT IS.*

This grain contains in its natural state all the proximate principles that enter into the composition of the body, or rather the proximate principles of the two are so similar (some being identical) that they are easily appropriated by digestion and assimilation to the body's nutrition.

CHEMICAL ANALYSIS.

The following is a fair average analysis of good whole wheat:

Starch	57 88/100	Fibrin	9 37/100
Dextrine	4 36/100	Oil	1 88/100
Nitrogenous subst'nces, soluble in alcohol, but insoluble in water	0 42/100	Woody fiber	6 10/100
		Extractive matter	1 45/100
		Ash	1 75/100
Coagulable albumen	0 35/100	Water	16 82/100
Albumen, soluble in water and not coagulable, two kinds	1 35/100		100

ASH.

Potassa	30 88/100	Chloride of sodium	0 55/100
Soda	3 55/100	Sulphuric acid	0 88/100
Magnesia	11 08/100	Silica	3 20/100
Lime	3 55/100	Phosphoric acid	46 88/100
Oxide of iron	1 08/100		100

MORPHOLOGY.

Grains, or kernels of wheat vary from each other slightly in form, according to their variety, but in general, they are oblong oval, having a deep groove extending from end to end on one side. At one end is the brush of vegetable hairs; at the opposite extremity under an irregularly curved surface layer of bran, technically called the shield, is the *embryo*.

Fig. 2, A B, shows both sides of the grain, magnified six hundred diameters. C represents the grain the natural size.

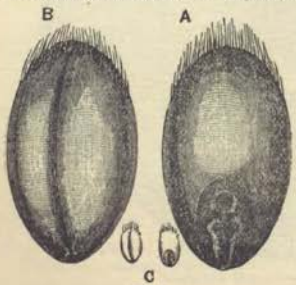


Fig 2.

If we make a transverse section of a grain midway between both ends, as shown in Figs. 1 and 3, it will be seen that it consists of an envelope, brown in color, enclosing a white, softer kernel. The envelope is known as the bran, and the inner portion as the endosperm, or gluten. Within the latter lies the embryo, or germ. Chemically, the bran of the grain is found to be richer in nitrogenous matter

*A. T. Cuzner, M. D., in *Alkaloidal Clinic*, June, 1897.

and salts than the endosperm. The germ also contains more proteid material and phosphates than the endosperm.

Fig. 4 represents the different coats of a grain of wheat peeled up and turned back. The first three coats constitute the true bran, which is nearly destitute of nutritious properties. It consists mainly of woody fiber and cellular tissue, holding nutritive salts, these constituting its whole nutritive value. Beside this, it is very irritating to the digestive organs. It absorbs water readily, and if moistened, and left in a mass it speedily ferments and decomposes.

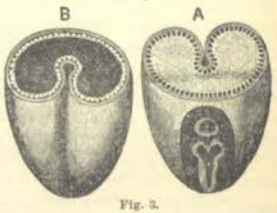


Fig. 3.

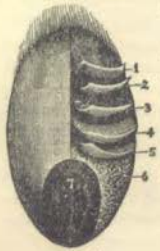


Fig. 4.

The coats 4 and 5 are mainly composed of cellular tissue and like the bran-coat contain nutritive salts; but unlike the bran, they are not irritating.

At 6 we have the gluten sacs and perisperms, and at 7 the embryo, which play an important part in the economy of nutrition.

GLUTEN.

The comparative baking qualities of different samples of wheat flour may be judged by the height to which in similar vessels the gluten of equal weights of flour is observed to rise. This quality is due, not to the crude gluten as a whole, but to that substance called glutine, or vegetable fibrin. Other cereals contain but a small percentage of it, their crude gluten being made up mainly of vegetable albumen and casein.

From one hundred pounds of "Pillsbury's Best" flour may be obtained thirteen and one-half pounds of very fine gluten. From Franklin Mills flour of the entire wheat, the writer has obtained fifteen pounds of gluten from one hundred pounds of flour.

A noticeable property possessed by gluten is its power of absorbing water. Ordinary flour of commerce will take up in bread-making one-half its weight in water. The inner mass of the grain, constituting seventy-five per cent of the whole grain,

consists of starch, gluten, albumen, sugar and gum. Of these ingredients fully ninety per cent is starch.

STARCH.

If we regard the enormous proportion in which the seeds of cereals and luguminous plants, and the different tubers, enter into our dietary it is not exaggerating to say that fully two-thirds of the food of mankind consists of starch. Starch, like sugar, is a carbo-hydrate, $C_{12} H_{20} O_{10}$.

Starch in a raw state is to man an almost indigestible substance; but when subjected to the operation of cooking it is readily digested. The digestion of starch in the human subject is accomplished by the saliva and pancreatic juice, which are rich in a substance called diastase, and to which they owe their power.

In the human infant diastase does not appear to exist in sufficient abundance to digest starchy substances until about the seventh month. Foods containing starch largely are unsuitable to young infants.

From examination we find that wheat as a food is most valuable, containing, as it does, all the proximate principles that enter into the composition of the human body.

This being conceded, it follows that if we can retain in the food manufactured from it these principles in a proper proportion, we shall have a perfect food for the ordinary wants of the body.

The Roman soldier as he marched, carrying his supply of whole wheat, was enabled to conquer the world. Fashion has decreed that flour shall be white.

White flour means little gluten and still less phosphates proportionately.

In this age of mental activity the call is for phosphorus.

Whence shall we obtain the proper supply?

Shall we call upon the pharmacists for some of their excellent preparations, or had we better use the natural supply found in the whole grain of wheat?

It takes two hundred and seventy pounds of wheat to make a barrel of flour by the ordinary milling process. We have (or should have) a loss of but thirteen and one-half pounds, whereas the actual loss amounts to between fifty and sixty pounds.

Of what does this loss consist—what elements of the grain are thus needlessly wasted?

They are the gluten and phosphorus.

FINE WHITE BREAD.

John Goodfellow, F. R. M. S., lecturer on physiology and hygiene at the Bow and Bromley Institute, London, member of the Society of Hygiene of France, author of "Bread is the Staff of Life," "Personal and Home Hygiene," honorable consulting chemist to the Master Bakers' Society, etc., has recently written a very complete and exhaustive book upon "The Dietetic Value of Bread." He writes strongly in favor of "*fine* whole meal bread." He denounces the ordinary brown bread, "coarse" whole meal bread and the "ordinary" whole meal bread. He says:

"Fine white flour is obtained from the central portion of the grain, *very finely ground.*

Whole-meal flour is obtained from the entire grain.

The chief difference between these kinds of flour lies in the amount of nitrogenous matter and salts which each contains. As we pass from fine flour to whole-meal flour, the percentage of nitrogenous material and mineral matter increases.

Fine white flour is poor in proteids, fat, and mineral matter; while the carbo-hydrates greatly preponderate.

Fine white bread is not a perfect food for the following reasons:

1. It is deficient in proteids.
2. It is deficient in fat.
3. It contains too much carbo-hydrate matter.

White bread is particularly deficient in calcium phosphate, which plays such an important part in the formation of new tissue, the outer portion of the wheat grain not being used. It is therefore less able to support life.

White bread is also deficient in iron, so that those who are anæmic should not partake largely of it.

Those who partake of white bread should take care to supplement it largely with other foods, richer in lime.

On no account should it form part of the diet of children or infants, unless supplemented by milk or other foods rich in lime and phosphates, for they require especially phosphate of calcium to form their bones and teeth, and to promote the growth of new tissue.

A very serious objection to the use of bread for infants is the fact that it contains *starch.* The diastasic ferments are not developed in early infancy, therefore starch is totally unsuited for ingestion into the alimentary canal. Many infants are hurried into an early grave by the serious derangements set up in

the intestines by the irritating action of the insoluble starch on the delicate mucous membrane which lines the alimentary canal.

Bread may be given to children above ten months, as the diastasic ferments of saliva and pancreatic juice have then sufficient power to act on the starch.

There can be no doubt that white bread is very easily and thoroughly digested—more digestible if made with yeast than if chemicals are used—and thus is of the utmost value as a food when the deficiency of proteids and salts is made up by other foods.

WHOLE-MEAL.

Whole-meal is obtained by reducing the entire grain, so that the outer layers that are richest in albuminoids and phosphates, and which yield the bran, are retained in the flour.

An analysis reveals the fact that whole-meal is richer in these food substances than fine white flour, to-wit:

	FLOUR.	WHOLE-MEAL.
Water	12	14
Proteids	$9\frac{5}{10}$	$14\frac{5}{10}$
Carbo-hydrates	$76\frac{5}{10}$	$66\frac{5}{10}$
Fat	$\frac{5}{10}$	$1\frac{5}{10}$
Fibre	$\frac{7}{10}$	$1\frac{5}{10}$
Mineral matter	$\frac{3}{10}$	$1\frac{7}{10}$
	100	100

An analysis does not always indicate the dietetic value of a food. The value of whole-meal depends on its fineness. Bread made from *ordinary* whole-meal is not always a desirable food. Ordinary methods of grinding do not reduce the hard envelope of the wheat grain to very fine particles, and no whole-meal is satisfactory unless the bran is very finely divided. The finer the bran particles, the more thoroughly whole-meal bread is assimilated.

WHOLE-MEAL BREAD.

Whole-meal bread varies in composition according to the wheat from which it is made. The following represents a fair average sample of whole-meal bread, and pure white bread:

	WHOLE-MEAL.	WHITE.
Water	40	37
Proteids	$12\frac{7}{10}$	$7\frac{5}{10}$
Carbo-hydrates (starch, etc.)	$43\frac{5}{10}$	$53\frac{5}{10}$
Fat	$1\frac{5}{10}$	$\frac{5}{10}$
Fiber	$1\frac{5}{10}$	.....
Mineral matter	$1\frac{5}{10}$	$\frac{5}{10}$
	100	100

Compared with white bread it will be seen that the ratio of nitrogenous bodies is much higher; the carbo-hydrates much lower, and slightly more fat and mineral matter.

On the supposition that ordinary whole-meal bread is digested to the same extent as white bread, it would approximate very closely to a perfect food as regards nitrogenous ratio, but experiments have proven that it contains far more waste material than white bread, that about twelve and one-half per cent of it is excreted undigested from the alimentary canal in the form of woody fiber, cellulose, salts, proteid material, and fat. The waste of white bread is only three and eight-tenths per cent.

Ordinary whole-meal bread, then is not a perfect food for the following reasons:

1. It yields too little proteid to the body.
2. It yields a surplus of carbo-hydrate material.
3. It is deficient in fat.
4. It is deficient in mineral matter.

If all its proteid material were digested in the body it would be an ideal food. The only method to secure this result is to make the bran much finer, for the finer the bran the more thoroughly the whole-meal bread is assimilated. Coarse whole-meal bread is more nearly a perfect diet for adults than for children.

Fine whole-meal bread is better for children than white bread.

"Enumerating, it may be said, ordinary whole-meal bread is unsuitable for children because:

"(1.) It iritates unduly the intestinal tract.

"(2.) It increases the waste of other foods.

"(3.) It may produce diarrhœa.

"(4.) It yields a less quantity of nutriment, both organic and inorganic, to the body than *white* bread."

In the Iowa Monthly Health BULLETIN for August, 1896, a talented and very close observer writes over the signature of "Soliped" as follows:

FINE WHITE WHEAT FLOUR VS. COMMON SENSE.

It has come to be known that the patent flour processes of the day are really sacrificing nutrition to appearances and to greed. They produce beautiful fine white flour, to be sure, but to that end, measurably eliminate its food value. Many brands of this new process flour are milled so very fine that they have a velvety feel, like corn starch for example, when rubbed between the finger and thumb. These are the most objectionable,

even though the most saleable specimens, but then, the quantity of flour extracted from the grain is greater, the miller's profit is increased and the flour made whiter and finer to the special delectation of simple souls, who do not realize that the nutritiousness of the product is in inverse proportion to its bulk and elegance and that it is incapable of yielding the "Bread which strengtheneth man's heart"—the "stay and the staff, the whole stay of bread," or, in other phrase, "the *staff* of life." In these closely dressed flours—as Pavy observes—"the starch granule becomes bruised and damaged and is found to be deteriorated for the purpose of bread-making." It is well known that experienced bakers prefer to use a flour which feels a little gritty when rubbed between the thumb and finger, so, also, do good housewives. The housewife and the baker both know that such flour makes wholesomer bread—"a bread with more *body* in it," as one woman said to me the other day—but neither knows the reason why. That reason is found in the fact that in the coarser flour a larger proportion of the phosphates—the bone and muscle builders—is always present, and the logical deduction from this fact is, that in whole wheat flour these important mineral elements are entirely preserved. The makers of these modern (vicious) flours in thus—either ignorantly or designedly—destroying the food value of their wares, have made straight the paths of the drug-monger, who has reaped golden harvests during the past twenty years, trying with his costly phosphate compounds to replace those potent elements which the miller has thrown out of the universal food; elements that inscrutable chemist-nature has compacted in the wheat-berry with a deftness, an all-wise design, human chemists, with all their capacity for substitution are incompetent to achieve. But, says the optimist: Fine white wheat flour bread is more pleasing to the palate and to the eye. Why, then, should we not serenely eat of it and let the drug-monger supplement it with the minerals it is said to lack, taking them in heroic doses as though they were grace after meat? The reply is: The artificial cannot equal the real, however accurate the imitation may be. To largely eliminate the food elements of the flour, in order to cater to the untenable likes or dislikes of the uninformed, then to attempt to hedge by replacing those discarded natural principles with the chemists' varying inventions, is irrational and un-hygienic, forasmuch as it contravenes immutable law. The celebrated Majendie found, many years ago, that dogs fed exclusively on white bread died in fifty days. Others fed on coarse bread exclusively lived and thrived. These experiments of the eminent Frenchman, were carefully made and were numerous. They should not have been forgotten.

In a recent article in a foreign newspaper, which evidently is from the pen of an expert, I find the subjoined paragraphs. They are worthy careful reading:

We have only to consider the composition of the wheat-berry, and to know what portions of it are used for the bread we eat, to realize the amount of material that is wasted in the present system of panification.

Proceeding from the outside to the inside of the wheat-berry is composed of the following portions: 1. An external wrapping, or episperm, containing only fibers, fatty and aromatic substances, and salts, representing $14\frac{35}{100}$ per cent of the total weight of the berry. 2. A farinaceous portion, equal to $84\frac{21}{100}$ of the total weight, and whose richness in starch

increases from the periphery to the center, whereas the amount of gluten and phosphates increases from the center to the periphery. 3. The germ, or embryo, which is only equal to $1\frac{35}{100}$ of the weight of the berry, but is very rich in phosphates and in nitrogenous and fatty substances.

The mineral substances are composed largely of very assimilable phosphates; they are chiefly to be found in the germ, or embryo, which is usually thrown away with the other unused parts, especially now that millingstones have been replaced by metallic cylinders, and their richness in nitrogenous and fatty matter is relatively considerable. The layer of starch that sticks to the inner layer of the episperm, and is hard to separate from it, remains with the gray meal that is not mixed with the fine white flour, or white meal, for fear of altering the color of the bread.

In this way is produced a flour of good quality, containing only six grams of mineral substances, whereas the kilogram of wheat that furnished it contains ten. The difference is so marked that the time seems to have come to use every possible effort to find some way of remedying it.

From what we have said it will have been seen that as regards introducing phosphates into our daily food it would be very advantageous to use not only the germs, but the most peripheral gray and red portions of the grain. Bread will only be entire when it contains all the truly alimentary portions of the wheat-berry. This, however, is very different from what is meant by persons who consider entire bread as ordinary bread to which the bran has been added. Once more let it be said that the only bread worthy of such a denomination is that made with flour containing all the assimilable elements of the wheat by being sent a number of times through the grinding surfaces. The difficulty is to separate by bolting the coarse bran, which is of no use, from the starchy portions that adhere so closely to the fine bran that lines the coarse wrapping of the berry.

There is evidently a happy medium to be found between bread that is too white and the too entire bread that certain enthusiasts wish to impose upon us as the ideal of bakery, and which by containing a great deal of bran is useful to persons whose intestinal functions are not what they should be, but is of no advantage to healthy persons. The country bread, *pain de menage*, which was formerly so extensively used, is both nourishing and agreeable to the taste, and we regret very much that this bread has gradually disappeared from use in large cities as being an inferior article.

The mission of hygiene is to rescue the people from the heavy hands of the food adulterator and his alter ego, the drug-monger, who reaps where the other has sown. Dissemination of the truths of the comprehensive science of dietetics is a means to the benign end, and the legislative and other work done in this direction during the past decade has not been done in vain, as its fruitage amply attests.

Edward Smith, M. D., LL. B., F R S., Fellow of the Royal College of Physicians of London, etc., in a book on "Foods," published by D. Appleton & Co., speaking of the retention of bran in the flour and of the brown bread made therefrom, says this outside layer of wheat, the coarse bran, being covered with a layer of silica, is indigestible, remains as a foreign body in the bowels and is apt to get up irritation; that the only nutritive value which it contains is in the gluten and starch which lie in its inner side. He says: "This laxative quality may be medicinal, but it is not nutritious, and may be more useful in one form than another, and at one

time than another. That it can add directly to nutrition is impossible, and whilst it may be more useful to those who are well fed and need a laxative, it may be worse than useless to the ill fed, who need nourishment. * * * The disadvantage of its use was insisted upon by me when treating on the dietaries of the poor, and the compulsory dietaries of prisoners and paupers, and it was shown that the discarding of it by the poor in favor of a finer flour was based on sound experience of its value. * * * It was also shown that bread was more agreeable without it, and the children of the poor were content to eat it dry when they would have been disgusted with dry brown bread, or would have required treacle or some savory or expensive addition to induce them to eat it. Thus it was shown that white bread is now the poor man's food."

Alexander Winter Blyth, M. R. C. S., F. C. S., etc., a very prominent English physician and chemist, in "Foods: Their Composition and Analysis," a work of nearly six hundred pages, after describing the different kinds of bread in use and their relative nutritive value, says: "It is thus shown that of the black bread a person would have to eat very much more than of the white bread. The white wheaten bread was nearly all absorbed. That this experiment was not made with whole wheaten bread is true, but it still unmistakably casts some doubt on the question as to whether whole meal would be more nourishing than pure white flour."

NUTRITIVE VALUE OF FLOUR.

In Bulletin No. 21, of the United States Department of Agriculture, is given the results of investigations on the Chemistry and Economy of Foods, by Prof. W. O. Atwater, Ph. D., a chemist whose opinions and reports are entitled to the greatest respect. In Table Two, page thirty-three, he gives the relative percentage of nutrients in different kinds of grain, to wit:

MATERIAL.		Water.	NUTRIENTS. Protein.	Fat.	Carbo-hydrates.	Mineral matters.	Total.
Rye flour	Min.	12·4	·6	·8	77·9	·6	86·4
	Max.	13·6	7·1	·9	79·5	·8	87·6
	Aver.	13·1	6·7	·8	78·7	·7	86·9
Wheat flour	Min.	8·2	8·6	·6	71·6	·3	85·7
	Max.	14·3	13·6	1·8	79·5	·7	91·8
	Aver.	12·5	11	1·1	74·9	·5	87·5
Graham flour	Min.	12·1	11·3	1·5	71·6	1·7	86·3
	Max.	13·7	12·4	1·9	72	2	87·9
	Aver.	13·1	11·7	1·7	74·7	1·8	86·9
Entire wheat flour	Min.	12·9	13·1	1·9	69·5	1·4	86·9
	Max.	13·1	14·1	2	70·5	1·4	87·1
	Aver.	13	13·6	2	70	1·4	87

In Table Thirteen, page seventy, he gives the percentage of the nutrients of wheat, digested as follows:

	PROTEIN.	FAT.	CARBO-HYDRATES.
Wheat flour, fine	85	80	95
Wheat flour, medium	81	80	95
Wheat flour, coarse	75	80	95
Wheat bread	7·1	1·4	53·4

He sums up his research by saying: "We shall never be able to lay down hard and fast rules to apply to all cases as to how much of each of the different nutritive ingredients of food are needed to supply the demands of people of different age, sex and occupation, because of the differences between individuals in respect of their demands for nutriment and the ways in which their bodies can make use of different kinds of food.

"The purpose of these investigations is to secure the proportions of nutritive ingredients; their digestibility; their fuel values; the ratio between their values for nutriment and their cost; the kinds of food and proportions of nutriments best adapted to the people of different classes and occupations; the errors in our food economy, and the sociological and agricultural bearings of the subject. All bear directly or indirectly upon health, home life and household, agricultural and national economy."

HOW FOOD IS USED IN THE BODY.

"Food supplies the wants of the body in several ways:

1. To form the tissues and fluids.
2. To repair the wastes of tissues.
3. Is stored for future consumption.
4. Is consumed as fuel, its potential energy being transformed into heat, or muscular energy, or other forms of energy required by the body.
5. In being consumed protects tissues or other food from consumption."

USES OF THE NUTRIENTS.

Protein forms tissue (muscle, tendon, etc., and fat) and serves as fuel.

Fats form fatty tissue (not muscle, etc.) and serve as fuel.

Carbo-hydrates are transformed into fat and serve as fuel.

All yield energy in form of heat and muscular strength.

The bodily machine is made of protein. The blood, muscle,

tendon, bone and brain, all consist of, or at least contain, protein compounds. As the muscles and other tissues are used up in bodily activity, the same materials of the food are used for their repair.

HEALTHFUL BREAD.

Dr. J. W. Smith, Charles City, Iowa, writes as follows:

If bread is the most essential form of human food, it may well be called "the staff of life." It is then highly important that bread should be made in the best possible manner. While it admits of great variation as to material and manufacture, there are essential qualities that cannot be ignored. They are the God-given elements in all the best cereal grains of which bread is made.

Milk is called a perfect food, especially for children, as it contains in proper proportion all the elements necessary for the growth of the young being, child or animal. The fact plainly shows the wisdom and goodness of the Creator. The grains, wheat, rye, oats, barley, corn, rice, etc., also contain elements just as essential for the growth and sustenance of human beings at a little older period of life than when only a milk diet is used.

Fashion is said to rule the world, and not always wisely. If we grow wiser in some things, we are also in great danger of growing weaker in some other things. White flour, and the whiter the better, has been the rule with most of our most estimable lady cooks until a vast injury has been done to the human race, especially in the United States.

If the mass of the people continue on for a few more generations, like the past few, good teeth will be a thing of the past, and almost any teeth in an adult American will be so unusual as to be a curiosity Neither will the injury stop with the almost universal loss of the teeth—so essential to good health. Their loss also indicates a general failure or breaking down of all the powers of the body.

Many serious diseases, especially of the digestive organs, are directly caused by improper food, or that which lacks some element or elements necessary for the growth and sustenance of all parts of the human body in a healthy condition. Can we not and will we not learn by observation and experience? Must fashion be followed to the destruction of health and life itself?

God is wiser than we are—is all-wise—and constituted the cereal grains in the most perfect manner for food of human beings. In the manufacture of the whitest flour certain elements essential to the nourishment of portions of the body are almost wholly excluded. Unless such elements are replaced in some way, the work of growth and repair for the whole body cannot go on.

The teeth, the nerves, and digestion are among the first parts to suffer. The dentist, the doctor and patent medicine men try their vocation upon all the sufferers—not always knowing the chief cause of their increasing gains. Of what use is the teaching of physiology (?) in our public schools if its lessons are to be generally ignored by fashionable living? The children are not to blame, but parents and teachers must be held chiefly responsible for much sickness and death of the young.

We hear much about high civilization in our land. How does human health and endurance here compare with nations that uniformly use "black" or unbolted flour for bread? Is not high health preferable to so called culture that destroys good health and results in an effete class or nation?

A campaign for correct living is a necessity in our nation, at least, if we do not wish to see others of more robust health soon take our places and of our children. To prevent such a result, plain, wholesome foods and simple, correct living must soon take the place of much of our present methods. Good bread is about three times as nutritious by weight as the best meat. But the best bread cannot be made from the whitest flour. It must contain a certain proportion of all the excluded portion of the kernel of the grain. Wheat comes the nearest to a perfect food of all the grains, when used in nearly the unbolted form. Good flour cannot be made from poor grain nor good bread of bad flour. Ergot in rye has caused mortification of the limbs.

Most of the bread of civilized nations is made with some form of yeast, and a fair article of bread can be made with the many forms of yeast; but there are objections to all such bread. The effect of yeast is to commence a fermentation, or really a rotting process in the flour, and which is intended to be stopped by baking the dough at the proper stage. It is not always easy or even possible to stop the fermentation at such stage. If done too soon the bread will be heavy. If done too late the bread will be over-fermented—a "big loaf," probably sour, and its food value much lessened: The latter form is the kind of bread usually found in most country bakeries and in many families. The large cities usually have good bread, of the kinds made. Alum and other drugs are sometimes used with poor flour and badly managed bread.

By unleavened bread is meant almost any form that is not made with yeast or any form of "baking powder." Aërated bread is now used almost wholly in London and some other cities of Europe, and has been to some extent in American cities. It is made by pressing air into the dough by machinery, and baking at once. It is probably the nearest to a perfect bread, and there is no loss of nutritive value, as happens with all yeast bread. Perhaps from popular prejudice for yeast bread, or the difficulties of the manufacture of aërated bread, yeast bread is still in general use.

The writer firmly believes that there is a more excellent way of bread-making than those now in general use, and that it is also some kind of unleavened bread.

FRUITS.

Ripe fruits of nearly all kinds, are attractive, delicious, appetizing and healthful. They may be placed in the first rank of subsidiary, or luxurious food, since they supply an agreeable and refreshing material when eaten alone, or with other food. They may be taken by the sick, when all else is rejected, and

thus by acting on the sense of taste, a desire be stimulated for nutritious food.

The principal varieties, in use, are:

1. The apple, pear and quince.
2. The orange, lemon and lime.
3. The plum, peach, apricot, cherry, olive and date.
4. The grape, gooseberry, currant, cranberry, barberry.
5. The strawberry, raspberry, blackberry, mulberry.
6. The melon, pineapple, fig, banana.

Bauer gives the following average composition of some of the most important of these:

	Apple.	Pear.	Peach.	Grape.	Straw-berry.	Currant.	Orange. (Pulp only.)
Water	83·58	83·03	80·03	78·18	87·66	84·77	89·01
Nitrogenous matters	·39	·36	·65	·59	1·07	·51	·73
Free acids	·84	·20	·92	·70	·93	2·15	2·44
Sugar	7·73	8·26	4·48	14·36	6·28	6·38	4·59
Non-nitrogenous matters	5·17	3·54	7·17	1·96	·48	·90	·95
Cellulose and kernel	1·98	4·30	6·06	3·60	2·32	4·57	1·79
Ash	·31	·31	·69	·53	·81	·72	·49

The analysis shows these fruits to be rich in potash salts; the apple and strawberry rich in soda salts. They also contain salts of lime, magnesia and iron; also salts of vegetables (malates, citrates, tartrates) and some free acid.

Their chief food value is in the sugar they contain. When taken in moderate quantity they are cooling and refreshing, and tend to promote intestinal action, and correct a tendency to constipation.

Some of them more nearly approach to food than others. The olive offers a true food in the form of oil, and stimulates the appetite, when pickled, so that it serves the poor and ill fed in the former, and the rich and over fed in the latter. In the fresh state it is eaten daily by rich and poor as a pleasing fruit and as a true food.

The date, is a highly nutritious fruit. It contains fifty-eight per cent of sugar, and is eaten when fresh or dried. It is one of the chief articles of food of the Arab.

Of the apple, Dr. R. G. Searles, of Brooklyn, N. Y., says:

The apple is such a common fruit that very few persons are familiar with its remarkably efficacious medical properties. Everybody ought to know that the very best thing they can do is to eat apples just before retiring for the night. Persons uninitiated in the mysteries of the fruit are liable to throw up their hands in horror at the visions of dyspepsia which such a suggestion may summon up, but no harm can come to even a delicate system by the eating of ripe and juicy apples just before going to bed. The apple is an excellent brain food, because it has more phosphoric acid in easily digestible shape than other fruit. It excites the action of the liver, promotes sound and healthy sleep, and thoroughly disinfects the mouth. This is not all. The apple helps the kidney secretions and prevents calculus growths, while it obviates indigestion and is one of the best preventives known of diseases of the throat. Everybody should be familiar with such knowledge.

Most persons who discard fruit because of their fear of appendicitis use the pulpy fruits, such as apples, pears, plums and peaches freely and confidently, while they deny themselves the many-seeded fruits such as raspberries, blackberries, strawberries, grapes, etc. These small and many-seeded fruits can always be eaten with impunity if taken with other food, especially with bread, potatoes and such glutinous and starchy foods as afford a covering for the seeds. It is surprising what sharp and rough and indigestible substances will safely pass through the whole intestinal track without doing any injury at all, if plenty of potatoes, bread, or oatmeal is eaten at the same time. The best time to eat any fruit is at the table and with other food. Appendicitis is not any more common than it used to be. It is only more generally recognized, and it is the explanation of many sudden and fatal attacks of peritonitis, or inflammation of the bowels—the causes of which were unknown. It is foolish for persons to deny themselves the pleasure of eating fruit through fear of infection by microbes or appendicitis because perhaps one in a million persons happens to get a seed in the "appendix." Fruits are among God's good creatures grown for the delight, enjoyment and physical benefit of rich and poor, prince and peasant.

All fruits with skins on should be washed and peeled before eating — especially fruits exposed on the streets and where dust and flies can have access to them. Few are aware of the danger of food contamination by flies. They are great scavengers, and are not at all choice as to what they eat, nor where they step. They pass at one bound from an infectious carcass, a foul ulcer, or a mass of diseased sputum or reeking filth to the apple, pear or peach, and with dirty feet and dirty proboscis run over it and contaminate it. Hence all such fruit should be first washed and dried and then pared if possible. Even food to be cooked ought for cleanliness sake to be washed if cooked with the skin on.

TUBERCULOSIS.

ITS PREVENTION.

At the May meeting, 1897, of the Board, Dr. J. M. Emmert presented the following paper, which was ordered printed:

Can tuberculosis be prevented? is one of the most important questions of the day. Sanitarians, physicians and other scientists are not alone interested in this question, but it is of vital interest to every father and mother, brother and sister.

When we remember that the "Great White Plague" is the cause of every seventh death; that in the State of Iowa nine persons die of tuberculosis every day, three thousand every year; that the United States contributes every year one hundred and fifty thousand and the world five million, I say, when these facts confront us it is no wonder that the people are asking what can be done to prevent this disease All infectious and contagious diseases are preventable to a certain extent, and among the list there is none that has received so much patient, scientific study and investigation as that of tuberculosis, and to-day there is no disease in the infectious and contagious list that we so thoroughly understand the natural history of, the germ causing the disease, its modes of growth, products of growth, its climatic distribution and modes of infection

Notwithstanding the accumulated knowledge upon this subject, and our thorough understanding of the disease, we have made but little advancement toward preventing or stamping out the disease.

Our boasted knowledge of the cause of the disease is of little use to humanity if we do not use it in applying preventive measures.

The disease can be prevented to such an extent that many valuable lives may be saved by obeying certain hygienic and sanitary laws, thereby rendering persons less susceptible to the disease and removing the cause, which consists in destroying the pathogenic germs.

Hereditary transmission is now looked upon as very doubtful, if not impossible, but there is inherited a condition that predisposes the person to the disease, a condition that makes of the system a suitable culture by inviting the disease and making it dangerous for the person to breathe air but slightly contaminated with poison, and for even a few minutes

This class of persons can do much in avoiding the disease and live long and healthy lives by giving special attention to personal hygiene.

The most important factor in preventing the disease in predisposed persons is that of fresh air and sunlight. God has given man no better disinfectant or disease destroyer than these two universal elements. The person should live in the fresh air and sunshine as much as possible. Dr. Trudeau, of Baltimore, in a paper before the American Climatic Association, very truthfully says: "All means which tend to increase the vitality of the body cells have been found to be precisely those which are most effectual in combating tuberculosis; one by one, specific methods of treatment which for a season enjoyed popularity have fallen into disuse, and hygienic, climatic, and feeding—in other words, a favorable environment, have alone given results which have stood the test of time." The home should be high and dry; no damp cellars, no leaky sewer pipes, or cesspools, or filth piles should be tolerated; the sleeping room should be well ventilated and living rooms the same; all indulgence in alcoholic liquors, tobacco, over-eating, worry, anxiety and mental strain should be avoided. All these lower the vitality, and consequently the personal resistance.

The methods of infection are almost entirely confined to two sources: from tuberculous animals to man, and from one human being to another. There are two principal channels by which the germs get into the system, the lungs and stomach. Although direct inoculation by way of denuded surfaces may, and often does take place, as in operation and *post mortem* wounds, it has been abundantly proven that eating uncooked or partially cooked tuberculous meat, and drinking milk containing the tuberculous bacilli, will produce tuberculosis in the human being.

To avoid the danger of infection from meat and milk there should be a most rigid system of inspection of all cattle for food and milk supply in each county. This should apply not only to the larger towns and cities, but to the villages as well, with supervision over all farm stock. Literature should be distributed among the dairymen and farmers, instructing them how to house, feed and care for their cattle to prevent tuberculosis; they should also be instructed how to use the tuberculin test, and how to treat all suspected animals. In by far the largest number of cases, tuberculosis has been caused by the disease in some other human being. If we ever succeed in preventing tuberculosis, it will have to be along the line of personal and legal control of those already infected. This may not necessarily mean strict quarantine, but it does mean an abridgement of personal liberties, a medical or legal supervision of action, with entire control of all excretions from lungs and bowels.

Every case of pulmonary tuberculosis is a walking culture bed, sowing seed broadcast. He is a wholesale dealer in his particular line of living germs; he is a living example of the parable of the sower: "A sower went forth to sow his seed, and as he sowed, some fell by the wayside, and others fell on good ground, and it sprang forth and bore fruit an hundred fold." Unfortunately for the human family many fall on good ground and keep up the fearful mortality stated in the beginning of this paper. There is no longer any doubt as to the correctness of Koch's theory; the germ has been isolated and injected into animals, producing this disease, demonstrating that the bacillus is the cause of the disease.

But of as much, if not more interest to us, is the fact that the sputa of a pulmonary tuberculous patient is loaded with these germs, and that this sputa fed to animals or injected into them will produce the disease. It has also been proven by scientific investigation and demonstrated that these germs will maintain their vitality for months in a dry state, floating in the air, to be carried into the lungs of the unsuspecting victim.

Some authors go so far as to say that ninety per cent of cases are produced by inhaled germs thrown off in the sputa of an infected person. If these statements are true, and I believe they are, how necessary it is to prevent the spitting by tuberculous persons, upon the streets, in stores, hotels, depots, railway cars, in fact, anywhere and everywhere, except a receiving vessel, containing a strong antiseptic solution, or in cloths or other materials that can be burned at once.

The promiscuous spitting of tuberculous matter is not only spreading the disease throughout the inhabited globe, but is making a pest-house out of some of the most healthful parts of the country, but unfortunately used for health resorts for these patients.

The Denver *Medical Times* says: "It was some time ago intimated in an Eastern paper that the streets and walks of Denver were covered with the sputa of consumptives. The statement was not far from the truth. Unless very rigid measures for the prevention of the spread of consumption in Colorado are adopted and put into force, Colorado will become a pest-hole." The *Pacific Medical Journal*, recognizing the danger, insists upon stringent measures being adopted to stop expectoration upon and about public places. The inhabitants of Los Angeles have become aroused to the danger of indiscriminate mingling of consumptives with healthy persons, and the board of health of this city has passed an ordinance against expectorating upon the streets and in public places. San Francisco has passed the same kind of an ordinance which, so far, has been impracticable. While the people are not ready to endorse and give their moral support to the enforcement of a street quarantine law, a law can be so drawn as to have the endorsement of the best people of every community; such a law should require the placarding the premises to warn the predisposed from entering, to require the sputa to be received in cloths and upon paper, and immediately burned. The first law of nature, self-preservation, would demand at least this much. The patient should not be allowed to attend large gatherings, especially in closed rooms containing children. They should be allowed to travel the streets, walks and roadways only when they carry receiving vessels for the sputa, and a fine should be attached for expectorating, except in this vessel, while absent from the house. The eminent sanitarian, Henry B. Baker, secretary of the Michigan State Board of Health, advises small pieces of cloths, each large enough to receive one sputum, and parafined paper envelopes or wrappers in which the cloth as soon as once used may be put and securely enclosed, and with its envelope, burned on the first opportunity

Dr. George Casnet, of the Berlin Hygienic Institute, with the dust gathered from the walls of rooms inhabited by tuberculous persons, and not contaminated directly with the sputum, has, upon being mixed with sterilized bouillon, and then injected into the peritoneal cavity of guinea pigs, produced tuberculosis. Twenty-one hospital wards were examined in the same way and the dust from fifteen of them produced tuberculosis. This admonishes us that thorough disinfection of all buildings, rooms and wards where persons have died of tuberculosis should be had, and that all sick rooms should be ventilated as thoroughly and as often as possible, as well as occasionally washing down the walls with a disinfectant and then whitewashed, which also should contain some disinfectant not injurious when inhaled. There is another sower that has attracted some attention lately

and will more in the future; that is the railway coach, and especially the elegant Pullman cars; they are veritable "whited sepulchers, which indeed appear beautiful outwardly, but within are full of dead men's bones, and of all uncleanliness." With all its magnificent settings, rich tapestries and beautiful velvet curtains, it is a modern death-trap of the worst kind Think of being closed up a room forty feet long and ten feet wide, containing probably forty persons, among them two or three consumptives, without any ventilation, except when the doors are open, and then for a moment, filled with hangings and velvet-covered seats that had accommodated probably hundreds of tuberculous and other diseased persons, with only an occasional dusting which only brought out the germs that had hidden in the dead recesses of the velvet folds, ashamed to look a poor mortal in the eye because he had no chance for his life. But this will all be corrected in the future.

The votaries of sanitary science, and those who love their fellow men, like Abou Ben Adhem, will rise up and demand that a sanitary car be built that will reduce the dangers of disease to a minimum. The law should demand that every trunk line, running through trains, should carry a hospital car, not only for the protection of the well but for the comfort of the sick. The closets upon cars should be so arranged that the dejecta could be received into a strong disinfectant befo e being thrown to the ground. It has been proven that the dejecta, both urine and fecal matter, contains millions of germs, and these germs are now being dropped all over this country to be dried and scattered to the four winds of heaven.

I have, in a very brief and disconnected manner pointed out a few of the important measures for arresting tuberculosis, and firmly believe that if they, as well as others, could be enacted into laws, the mortality from tuberculosis in the future would decline in a direct ratio to the enforcement of said laws.

CAUSE AND PREVENTION.*

In presenting this paper for your consideration I shall assume that you are all in sympathy with the germ theory as to the cause of tuberculosis—that with Koch you assent to the apparently well demonstrated proposition that tuberculosis in all its forms, whether occurring in the human or animal subject, is the result of morbific conditions arising from the presence and multiplication of the bacillus tuberculosis. If you are not a believer in that proposition I shall not at this time undertake to prove it.

Assuming therefore that this theory is correct, with the knowledge we have of the vitality and life processes of this bacillus, we are led to believe from analogy and from demonstration, that the disease produced by it is easily communicable: that it is contagious; and that the only successful way of combating it is by disinfection, or those measures that will most readily destroy the vitality of these micro-organisms.

In order best to treat the subject of this paper—The Prevention of Tuberculosis—your attention should be called to the generally admitted, and most common means of infection. There are two general sources: From tuberculous animals, by their flesh and milk to man; and from one human being to another.

*Read by Dr. J. F. Kennedy before the Polk County Medical Society, at Des Moines, July 6, 1897.

It is generally supposed that tubercular affections of the brain and bowels in children are caused by the ingestion of tuberculous milk and that these manifestations of the disease may be produced in the adult in the same way.

The methods of transmission from the human are fortunately comparatively few. As to heredity it is pretty generally believed that the disease is not transmitted, and yet there can be no doubt that children born of tubercular parents are more susceptible to the disease than others — that the bacillus, if introduced into the system, finds less resistance from a lowered vitality, and hence conditions are more favorable for its growth and multiplication.

Catarrhal affections, successive "colds" and pneumonia — especially when it assumes a chronic form — all favor the growth and development of the bacillus.

Among the indirect causes of tuberculosis, aside from heredity, are confinement in prisons and barracks; employment in crowded and ill-ventilated rooms; and occupations that require the breathing of dust and other foreign substances.

The most common direct cause, however, is the inhalation of the dried sputum of consumptives. It has been quite satisfactorily demonstrated that the breath of the consumptive is not infectious, and that the sputum itself is not, so long as it remains moist.

As a final proposition, it may be safe to say tuberculous infection is produced in the great majority of cases by the inhalation of dust laden with dried and pulverized tuberculous sputum.

The greatest and most rational preventive measures, therefore, are the destruction by burning, or the thorough disinfection of all tuberculous sputum; and care that the milk, butter and meat that are used are from non-tuberculous animals.

I have not the time, nor is it necessary to detail the methods of the prevention of tubercular infection by tuberculous sputum, and by food. Our text-books, medical journals, and lectures upon hygiene and preventive medicine, and all well-regulated colleges, happily abound in such information. I design rather, this evening, to enter a field not so well explored; to emphasize some conditions that very largely, though somewhat indirectly, contribute to this disease, and to recommend some preventive measures that are practical, and I believe if more generally and faithfully carried out would greatly reduce the number of cases, and as greatly increase the number of recoveries.

As before hinted, 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 tuberculous 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 "sanitaria," with the most encouraging results. In these resorts the inmates have the

advantage of a regular life, nutritious food, such exercise and chest distension 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 in 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.

Recently a book has been written by G. W. Hambleton, M. D., of London, England, on "The Suppression of Consumption." In his preface he says:

"Great cities are the centers of consumption, and far away from them, on the borders of advancing civilization, 'nature's cures' have been frequently accomplished. * * * The responsibility for the suppression of consumption rests with us."

The writer 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 can see no connection between consumption and impure air, night air, colds, catarrh, hereditary influences, improper food, insalubrious residences, improper sewerage or climatic conditions.

I think his position is rather sweeping, and yet there is much in it to commend. He says:

"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 so 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 eventually 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 progress in many cases of consumption."

"We can at any time watch the direct production of consumption by the constant inhalation of small particles of various substances, in strong, healthy men who have been brought up in the country, and we know the disease has been produced in this way for generations. * * * Occupations that are carried on in small, crowded, or badly-ventilated rooms, where the respiratory functions are impeded, or those in which there is a long continued cramped position of the chest, have long been notorious for the production of consumption."

Dr. Hambleton 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 English army—that notwithstanding these men were selected because of their physique—were examined before being enlisted, and reëxamined 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 develop 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 interferes 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 to-day 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.

But I have said enough to give you an idea of Dr. Hambleton's theory as to the cause of consumption, and will not weary you with further details, except to give you his conclusions:

1. Consumption has been experimentally produced by conditions that tend to reduce the breathing capacity. Koch's successful experiments were directly produced by those conditions.

2. We can at any time watch the direct production of consumption by these conditions in the dust-inhaling trades.

3. The trades and occupations that directly compress the thorax, or impede the respiratory functions are notorious for their production of consumption.

4. A large amount of consumption is produced in the army every year by these conditions.

5. Consumption has been repeatedly produced by confinement, both in man and animals.

6. The children of consumptive parents who become diseased have been carefully brought up under such conditions.

7. Consumption bears the mark of the effects of the progressive action of such conditions from its commencement to its termination.

8. There is no recorded case of consumption, experimental or not, in which these conditions were absent.

9. Where such conditions are absent there is no consumption in man or animal.

10. Upon their introduction, consumption immediately appears, both among men and in animals.

11. The disease presents a perfectly natural series of events when viewed in this light.

12. Its presence in our midst is due to the changes in our habits, mode of life and surroundings, that are being affected by the progressive advances of civilization.

13. Consumption has been prevented by the removal or counteraction of those conditions. The immunity of mountaineers is due to their capacious lungs.

14. The disease has been frequently arrested for a longer or shorter period by the accidental or deliberate adoption of measures that tended to compensate for, or counteract those conditions.

15. 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."

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 so far as possible; the freest and fullest ventilation of our homes; the discarding of all clothing or occupations that restrict chest 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."

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 preventive 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 attributes this falling off largely to the extensive use of the bicycle, especially by women.

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 that the methods of treatment recommended will commend themselves to the laity as well as to all schools of medical practice because of the large number of recoveries.

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 practical, treatment should be in hospitals or sanitaria, 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.

So I believe a better and brighter day has dawned, and that you, gentlemen, who are in the thickest of the battle against this dreaded foe shall, by proper measures, preventive and curative, see "the travail of your soul and be satisfied" with the glorious victories achieved.

PERIL TO CONSUMPTIVE RESORTS.

The observation of several years has forced the conviction that it is a great misfortune for any place to get a reputation as a favorable resort for consumptives; that the time is not far distant when the favored resorts of this country for those so afflicted would be so saturated with and dominated by the germs of this infectious disease as to be a constant menace to those who are native born and to the healthy sojourner.

It cannot be otherwise unless the universally accepted theory of its contagiousness be untrue. These patients wherever they go not only carry the contagious principle—the infectious germs with them, but in the sputa thrown from them they are constantly contaminating the soil and converting the delicious, invigorating, health-giving air provided by nature into a pestilential condition that is not only highly dangerous, but careful observation has shown has actually greatly increased the death rate in these health resorts.

This increased death rate from consumption is not alone caused by those going to these resorts for relief—many of whom are cured or greatly improved; but represents many of those who are born and raised there, or who have gone there in good health.

It is not caused by any changed climatic conditions—though it may to some extent be caused by changed social and domestic

conditions—by less out door life; because of better air-and-sunshine-excluding homes, and less of life that is near to nature's heart.

When the South Sea Islands were discovered consumption had never been known. Since contact with Europeans and Americans, however, this disease has become so prevalent as to threaten the extermination of the people. As the climate has undergone no change, and the habits of the people have changed but little, Dr. William Budd thinks this striking contrast in the health of the people can only be explained on the theory that a new and specific germ—the bacillus tuberculosis—has been imported to these islands.

Attention is called to extracts from two able medical journals published in the most noted health resorts in this country, which are printed not to deter any consumptives from going to these resorts, but to point out the danger to their friends who accompany them, and to those with whom they associate, whether at home or abroad, as well as to emphasize the importance of disinfecting or burning the sputa, which are almost the only means of propagating and extending the disease, and also that other health resorts may be induced to take such timely measures as will prevent a like experience. The *Denver Medical Times* says:

It was some time ago intimated in an Eastern paper that the streets and walks of Denver were covered with the sputa of consumptives. The statement was not far from the truth. Unless very rigid measures for the prevention of the spread of consumption in Colorado are adopted and put in force Colorado will become a "pest-hole." One thing that may help us out in this country is the fact that the amount of rainfall seems to be on the increase. There is no question that Colorado has probably the greatest climate in the world, all things considered, for the average consumptive, yet, in our opinion, it would be a fortunate and glorious day for Colorado to lose that reputation. With a better understanding of the cause of consumption and better knowledge of its prevention and better facilities and methods for its treatment, climate will not long, we trust, be a desideratum in the management of this disease. We now look upon tuberculosis and realize that it is the most contagious of all diseases known to humanity. Every consumptive who walks along one of our sidewalks and deposits a lump of tuberculous matter, loaded with consumptive germs, is deliberately, and, in most instances, intentionally doing that which will spread the very disease of which he is dying; and it was through just such criminal carelessness of some other consumptive that he contracted tuberculosis himself.

The *Pacific Medical Journal* has this to say:

It was very clearly shown a few years ago by certain careful observers that consumptives are liable to cause a health resort to become a dangerous

place to visitors who were not already consumptives; and especially so to its permanent inhabitants. Certain localities on the Mediterranean coast to which consumptives have resorted for many years have become so infected that the native population have themseves become tuberculous. This was especially noticeable among laundresses who handled the garments of consumptives. This subject was brought up before the Sanitary Convention at Los Angeles and so thoroughly discussed that it has already commenced to bear fruit. It was pointed out at that time that the southern portion of California, which, for the past ten years, has so freely welcomed consumptives to come and make this country their home, showed signs of the coming danger. We see by a la e Los Angeles paper that the community has become aroused to the danger of indiscriminate mingling of consumptives with healthy persons. Carefully collected statistics show that the native population of Southern California is becoming infected through contact with consumptives from the East. It has been the custom for families to take one or more invalids, irrespective of their disease, into the family for from three to six months. The result should have been foreseen; tuberculosis has gradually invaded the whole of Southern California.

It must be borne in mind that the surest method for the spread of this disease arises from indiscriminate expectoration. On drying there are set free numerous bacteria which are blown about by the wind and become mixed with the dust and breathed into the lungs. Indiscriminate spitting is the curse of the land. No spot is too sacred for the habitual spitter. In churches, halls, waiting rooms, at depots and public conveyances, everywhere in fact, you hear the hawking and spitting followed by the scrape of the foot as the spitter hastens disintegration of the sputum by rubbing the mass in the dust.

The Board of Health of Los Angeles a year or two ago passed an ordinance against expectorating on the streets and in public places, but there never has been any real attempt to enforce it. Every physician knows, or ought to know, that consumption is a contagious disease. He is in a position to better enlighten the people on this question than any other class, and he should never feel that he is out of place when proclaiming the doctrine of contagiousness of consumption and the care necessary to prevent its spread. Physicians must never permit a well person, especially a child, either to sleep or spend many hours continuously in the same room with a consumptive. There is already a growing conviction among the laity that there is something in this beside talk, and health boards at no very distant day will have the support of all right thinking persons in aiding the enforcement of strict sanitary laws.

In several cities ordinances against spitting in street cars have been vigorously enforced.

The San Francisco health board has authorized its attorneys to immediately prepare and have passed an ordinance for the prevention of expectoration on the sidewalks or in any conveyance.

Sir Benjamin Ward Richardson gives the following sanitary decalogue: First, pure air for breathing. Second, active exercise, outdoor as much as possible. Third, uniformity of climate. Fourth, dress that will sustain uniformity of warmth.

Fifth, careful regulation of the hours of rest by the sunlight. Sixth, outdoor occupation. Seventh, amusements that favor muscular development and sustain healthy respiration. Eighth, cleanliness in the broadest sense. Ninth, the avoidance of the ill-effects of cold. Tenth, an ample diet, with a full proportion of the respiratory foods.

TO CONSUMPTIVES AND OTHERS.

The health department of the city of New York has recently prepared for distribution the following circular, "Information for Consumptives and Those Living with Them:"

Consumption is a disease which can be taken from others and is not simply caused by colds. A cold may make it easier to take the disease. It is usually caused by germs which enter the body with the air breathed. The matter which consumptives cough or spit up contains these germs in great numbers—frequently millions are discharged in a single day. This matter, spit upon the floor, wall or elsewhere, is apt to dry, become pulverized and float in the air as dust. The dust contains the germs, and thus they enter the body with the air breathed. The breath of a consumptive does not contain the germs and will not produce the disease. A well person catches the disease from a consumptive only by in some way taking in the matter coughed up by the consumptive.

Consumption can often be cured if its nature is recognized early and proper means are taken for its treatment. *In a majority of cases it is not a fatal disease.*

It is not dangerous for other persons to live with a consumptive, if the matter coughed up by the consumptive is at once destroyed. This matter should not be spit upon the floor, carpet, stove, wall or street, or anywhere except into a cup kept for that purpose. The cup should contain water, so that the matter may not dry, and should be emptied into the closet at least twice a day, and carefully washed with hot water. Great care should be taken by a consumptive that his hands, face and clothing do not become soiled with the matter coughed up. If they do become soiled they should be at once washed with hot soap and water. When consumptives are away from home, the matter coughed up may be received on cloths, which should at once be burned on returning home. If handkerchiefs are used (worthless cloths which can be burned are much better) they should be boiled in water by themselves before being washed.

It is better for a consumptive to sleep alone, and his bed-clothing and personal clothing should be boiled and washed separately from the clothing belonging to other people.

Frequently a person suffering from consumption may not only do his usual work without giving the disease to others, but may also get well, if the matter coughed up is properly destroyed.

Rooms that have been occupied by consumptives should be thoroughly cleaned, scrubbed, whitewashed, painted or papered before they are again occupied. Carpets, rugs, bedding, etc., from rooms which have been occupied by consumptives, should be disinfected.

TENT LIFE FOR CONSUMPTIVES.

The following from the *Texas Sanitarian* contains a valuable hint not only for those who go abroad for "climate," but for those who stay at home. Life in the open air and "roughing it," with proper diet and clothing to suit the atmospheric conditions, are much more valuable than medicine:

On the 15th of last December a gentleman from Missouri brought his son, aged nineteen, to Austin, with well marked incipient consumption. Instead of stopping at a hotel or boarding house which he was amply able to do, he purchased a comfortable tent on the mountain side, near the great dam on the Colorado river, three miles above the city, and began a camp life under the advice of some sensible physician at his home. Here he and his son "roughed it" in such weather as came. They did their own cooking, spending most of their time in the open air, fishing, hunting, rowing on the lake, and exploring the wild country around them. When they wanted a steak, some vegetables, fruit, or anything from the city, they simply crossed the river in their boat, boarded the "dummy line" (now electric cars) and came down for it, but they lived largely on the game, squirrels, birds, rabbits, fish, etc., which abound in the neighborhood of their tent. On the first of February, just one and a half months from the day they took up their tent life, the father told the writer that his son had gained twelve pounds, and was able to lead him in climbing, rowing and eating.

The above is a practical demonstration of the value of tent life in the proper climate for those suffering with incipient tuberculosis.

In a sanitary convention held in Los Angeles, a discussion on house ventilation and the open air treatment of consumptives led Dr. Norman Bridge of that city to say:

"A person will not take cold by reason of cold air or moving air, provided his body is warm at all times; and, therefore, a patient may sleep in a tent, or under a wagon, or in a room with windows on nearly all sides, and windows wide open, and he may feel the current of air over his face every moment he is awake during the night, yet he will never take cold, provided his body is warm, and any person who has any considerable proportion of the normal vitality of the human body may keep his body warm by clothing it in wool. Therefore, one of the first steps for the profession to take, I am sure, is to convince the sick, certainly, and the well so far as possible, that in a country like this, where there is such a difference in the temperature of the day and the night air, and where so few houses are warmed in the night, that people should wear woolen night-gowns, and, if necessary, in the Winter time, should sleep between woolen blankets instead of cotton sheets; and, if necessary to protect the head, particularly if it is bald, from sensations of a draught, they should wear woolen night-caps. If they will do this they may be told, without any danger of a mistake, without any danger of accident, without any danger of their demonstrating that we are wrong, that they will not take cold, that they cannot take cold to save their blessed lives, if they will do these things. If we could do this for the sick we would remove one of those obstacles, I am sure, to good ventilation for sleeping-rooms. These people, with the miserable rooms they have, therefore, may have good ventilation when they are asleep. There is no difficulty about it at all. They have to be convinced, however. They won't believe this at first, but a reasonable patient will nearly always believe it. I have had a good many dozens of patients in the last five years here, who not only have believed it, but also have demonstrated it, and I will relate the experience of one of them—a tuberculous patient, who lives at Redlands. He was very much surprised when told that he could sleep in the open room, and that he had better sleep in a tent; that he might feel a current of air over his face without taking cold. He said he would try that, simply to see whether it was true or not, if for no other purpose. A year ago last Fall he went back to his home from his vacation at the sea side, and constructed a tent on the veranda of his house, that was twenty feet long and about five or six feet wide; and he put his bed in there, and slept in it all Winter, sleeping in woolen blankets and woolen night-gown, and a woolen night-cap over his head. The wind blew out one end of the tent and he never replaced it, but put his bed up to the other end, and let the wind blow and the rain come. He never caught cold, and he came down to me last year, as ruddy and vigorous looking as any person in Southern California or any other place in the world, declaring that he had not only not taken cold, but also had a very enjoyable time. Similar experiences have come to a large number of patients, but certainly only a few have made so severe a test as this man did. I am positive that this bugbear of a current of air endangering life to a person asleep, even if he is warm, is one of the greatest obstacles to a restoration of health, and one of the greatest obstacles to the keeping of health on the part of well people in this part of the country."

COMMUNICATED FROM HUSBAND TO WIFE.

That tuberculosis is contagious is established beyond controversy. The observation of nearly every physician evidences numerous instances where the communication of the disease was from the patient having been the constant companion or bedfellow of a consumptive person.

Clapp, in "*Is Consumption Contagious?*" cites twenty cases where wives were contagioned by their husbands, and thirteen

where husbands were contagioned by their wives. Among these were:

Louise D., born in the department of Aveyron, France, in 1866. Her parents and their parents were noted for longevity. She had eleven brothers and sisters, all of whom inherited the vigorous constitution notable in the family. At twenty-six she married a young man whose parents had died of consumption. A year following the marriage, he developed all the symptoms of consumption. The disease progressed to a fatal termination. The young wife, not wishing to add to the sufferer's uneasiness, and contrary to the advice of the physician, shared his bed until his decease.

She again married a consumptive, and the third year after this marriage her health began to fail, and three months later she died.

Bergeret reports the case of a man who was very stout, whose parents were both octogenarians, with broad chests and all the attributes of a powerful organization. Her husband died from consumption. She cared for her husband faithfully to the last, sleeping in the same room and seldom leaving him. Three years after her husband's death she died of the same disease, having suffered a long time.

Hermann Weber reports, in 1874, *Clinical Society's Transactions*, Vol. VII, the case of J, whose mother, two brothers and a sister died of consumption. He married four women, all of whom died of consumption, he following soon after the death of the fourth wife. At their marriage all the women were healthy and robust.

Weber also reports, *loc cit.*, the case of W, who belonged to a consumptive family, having lost his father and two sisters by that disease. He married three women, all belonging to robust families. Each died of consumption, and he soon followed the third wife.

Dr. S. D. Burgess, in *Transactions of Southern Illinois Medical Association*, 1879, reports the case of Mr. H. H., of consumptive lineage, and in the incipient stage of the disease married a woman of a remarkably healthy family, and noted for longevity. Eighteen months after marriage he died. Twelve months after his death the wife died of the same disease, having nursed her husband during his illness. The wife was nursed by a single sister, who died of the same disease eighteen months after the wife. This single sister was faithfully nursed by a brother,

and he also died of the same disease. The remainder of the wife's family lived at a distance, seldom visiting her, so that they escaped the contagion, not one of them ever manifesting any indication of the disease.

Dr. E. D. Kittoe, of Galena, Ill., in *American Journal of Medical Sciences*, 1878, page one hundred and forty-five, reports the case of the late Gen. J. A. R., whose parents were both remarkably robust and healthy, no taint of tubercular disease having been known to affect the ancestors of either the father or mother. The General was a remarkably strong and vigorous man. He married a woman who came of a consumptive family and in whom the disease developed soon after marriage. The General gave himself up almost entirely to nursing her, staying often in a close room with her up to her death. At the close of the war he was in a well-defined tubercular condition, and gradually gave way until he died. Three years before his death he married a woman, none of whose family had any tendency to consumption, yet she died of the disease eighteen months after the decease of the General.

The following letter received by the Secretary from an intelligent gentleman in Iowa details a family history that is not only sad but strikingly illustrates the fact of the infectiousness of consumption. How natural for the mother, after nursing two daughters with the disease, to succumb herself, and for the father and husband to follow!

....., Iowa, September 22, 1897.

Dr. Kennedy:

DEAR SIR—I have a chance to rent a good house here but it has the following drawbacks: The family that formerly lived in it died there as follows: *A daughter in 1888; another in 1890; the mother in 1893, and the father thirty days ago, all of consumption.*

It is a desirable property and will be repapered and painted throughout. In addition to this if each room was thoroughly disinfected, the floors cleansed thoroughly and treated to a coat of carbolic acid solution, do you think there would be any danger whatever in occupying the house?

An early reply will oblige, ...

The Secretary replied as follows:

MY DEAR SIR—I do not think there would be any danger under the conditions you speak of. If all particles of dust and dried sputum are removed or thoroughly disinfected there can be no danger

You should, in addition, ventilate all you can. Keep the house well open and let in plenty of fresh air and sunshine.

The presumption is that the house itself has a good healthy location.

Murrell, in *Lancet*, April 10, 1897, reports a case of a man apparently robust and in perfect health, who married a woman

of like physical condition. Her family history gave no taint of consumption. His father and sister died of that disease. Soon after marriage he sickened and died of consumption. His wife during the last seven months of his life nursed him incessantly. Soon after his death she sickened and died of the same disease.

Dr. Hermann Weber gives details of thirty-nine wives who were contagioned by consumptive husbands.

Instances by the thousand like the preceding can be cited showing the communicability of this disease, and the importance of the adoption of all possible measures to avoid the contagion.

The records show that more women than men fall before this disease. The reason is, because they are more exposed. As in war, more men than women are killed, because the former are more exposed. The wife is the natural nurse of the sick husband, and ministers to his wants day and night for weeks, months—it may be years, with total disregard of self.

Per contra, if it be the wife who is ill, the husband, who is the bread winner, commits the invalid wife largely to the care of others, so that he is away from the house more or less, and thus escapes the close and constant exposure.

The contagium however, is no respecter of sex.

TUBERCULOSIS IN THE SCHOOL ROOM.

The following letter from an intelligent and experienced physician in Iowa is from a practical standpoint and forcibly illustrates, as well as emphasizes, a source of danger too often overlooked:

....., Iowa, March 2, 1897.

J. F. Kennedy, M. D.:

DEAR DOCTOR—Permit me to invite your attention, and that of the State Board, to a matter that seems to have attracted no attention among physicians and educators. The only articles I have noticed in print were those over my own signature. I refer to the very dangerous habit of school teachers spitting on the floor in school rooms. It is not an uncommon practice in our country schools for teachers to habitually spit on the floor and then rub it down with the foot. I have known teachers to practice this daily who were then suffering from tuberculosis and died subsequently from its ravages. These persons (otherwise good teachers) did, of course, deposit millions of the tubercle bacilli upon the floor to dry and be inhaled by the pupils.

Have we not all treated cases of consumption contracted, beyond a doubt, in the school room?

While the teacher will positively forbid the boys to chew tobacco and spit upon the floor, she will daily deposit her disease germs within easy reach of the pupil's nose and mouth, and permit tuberculous pupils to do the same thing.

While the mention of this fact would astonish some of our legislators, it is certainly a matter of very serious import. Should not the State Board take the subject in hand?

I would suggest that no person be granted a certificate as teacher in our public schools who is not pronounced free from tuberculosis by a competent medical board; that it be made a penal offense for any one to spit on the floor of school room or church, and that disinfected spittoons be provided. If you can bring about such legislation your name will go down in history as a benefactor of the race. Yours truly,

..... M. D.

TYPHOID FEVER.

Typhoid fever, which was generally prevalent over the State during the first year of the biennial period, subsided very largely during the second year. The reason may be found in the increased rainfall, by which streams, wells, and sources of water supply were replenished, and the contamination thereof largely removed.

Typhoid fever is an endemic, infectious disease occurring in nearly all parts of the world. It occurs most frequently in persons under thirty years of age; oftener in males than females; and at all seasons of the year.

The microbe, or germ of the disease is communicated to the individual by the imbibition of water, milk, and other articles of food and drink. The bacillus finds lodgment in the intestinal canal, where it multiplies and produces the peculiar morbific effect.

The virus of the disease may be propagated among healthy persons:

1. By percolation through the soil into wells that supply drinking water;

2. By issuing through defective sewers or drains into the air of the inhabited area;

3. By exhalations from ill-trapped water closets or privies which are the receptacles of the discharges of the sick and the resort of the healthy.

The micro-organism is found in the excreta of the patient,

and not in the air surrounding the patient; hence the air coming from contaminated cess-pools, water closets, etc., is more dangerous than that from the sick room.

Milk absorbs quickly the germs from the typhoid patient and can be easily contaminated by carrying the excrement through a room in which the milk is placed. Milk thus exposed is a prolific source of infection.

CAUSATION AND SPREAD OF TYPHOID FEVER.

From an elaborate report of Dr. George M. Grober, special medical sanitary inspector, upon his investigation of five hundred cases of typhoid fever, in the District of Columbia, in 1895, is taken the following conclusions as to the cause and spread of the disease:

All scientific physicians agree that typhoid fever is caused by an organized germ capable of reproducing itself within and without the body, instead of such hypothetical matter as miasms or contagia, whose nature has never been demonstrated to our senses. On no other theory, except the germ theory, can we explain the occurrence of typhoid fever epidemics spread through the water and milk supply. If we reject the germ theory, we will indeed be forced to the conclusion that fecal and putrescible matter when present in milk or water in infinitesimal dilutions is capable of producing the disease in question. "A poison may produce sickness and even cause death, but it cannot infect, because it cannot reproduce itself."

According to the advocates of the germ theory, a certain number of typhoid bacilli gain admission, we will say, into the intestinal tract, and, if the conditions are favorable, begin to proliferate. It has been estimated that a single germ by growth and subdivision is capable of producing over sixteen millions of similar germs in twenty-four hours. In consequence of their own life's process they produce a soluble poison which, when absorbed, gives rise to constitutional symptoms, and in addition also acts as a local irritant and causes the lesions in the alimentary canal, characterized usually in the first week by infiltration, in the second week by ulceration, and in the third week by separation of the sloughs.

The intensity of the local and general symptoms doubtless depends not only upon the dose of the fever-producing agent, but also upon the individual susceptibility, or rather the aptitude, of the organism to feel the effects of the poison evolved by the germs. In this way we get our mild, medium, severe, or irregular types of enteric fever, differing simply in degree but not in kind.

A mild infection may give rise to abdominal catarrh, with symptoms of catarrhal jaundice, and temperature not exceeding one hundred degrees. Many of such cases have been observed, in which there was enlargement of the spleen, with the characteristic eruption.

Again, there are cases, though quite infrequent in the United States, which have been described as the abortive form, in which somewhere between the seventh and fourteenth day, as Jaccoud expresses it, "the

sickness takes a sudden turn and runs a course similar, as regards enteric fever, to that which varioloid runs as regards variola." Griesinger reports a case where the duration did not exceed five days.

Such cases can only be explained by assuming that the intestinal lesions undergo resolution, and that we simply have to deal with the primary fever and not with the secondary or septic fever due to the ulcerations and formation of sloughs.

CHANNELS OF INVASION AND MODES OF DISSEMINATION.

The invasion of the microbe most likely takes place through the alimentary tract, as evidenced by the primary intestinal lesion and the frequent dissemination of the disease through the water and milk supply. The possibility of transmission of the virus through the air should not be excluded, for, as in tuberculosis so in this disease, the infectious material may have become dried and pulverized and with particles of dust gain access to food or into the mouth, there to be swallowed or inhaled.

The principal source of transmission of the microbe, however, is through the water supply, infected milk and food, and there is much reason for believing that in such cases the virus proceeded from the dejecta of typhoid patients which gained access to the water supply directly or through the soil, or the wash water from patients and infected clothing and bedding, or found its way into vegetables and fruits, which are eaten raw, through the medium of fertilizers or washing them in infected water.

The agency of flies and other insects in carrying the germs from box privies and other receptacles for typhoid stools to the food supply cannot be ignored.

MILK INFECTIONS.

Dr. Busey and myself have tabulated one hundred and thirty epidemics of typhoid fever from all parts of the world, which were traced to contaminated milk.

In one hundred and nine instances there is evidence of the disease having prevailed at the farm or dairy.

In fifty-four the poison reached the milk by soakage of the germs into the well water with which the utensils were washed; in fourteen of these the intentional dilution with polluted water is admitted.

In six instances the infection is attributed to the cows wading in sewage-polluted water. In three instances the infection was spread in ice cream prepared in infected premises. In twenty-one instances the dairy employés also acted as nurses. In six instances the patients while suffering from a mild attack of enteric fever or during the first week or ten days of their illness continued at work, and those who are familiar with the personal habits of the average dairy boy will have no difficulty in surmising the manner of direct digital infection. In one instance the milk tins were washed with the same dish cloth used among the fever patients.

WATER-BORNE EPIDEMICS.

We have the experience of Plymouth to show that the excreta of a single typhoid patient washed into a stream caused over one thousand cases of this fever. A study of the epidemic at Cumberland, Md., 1889-'90, indicates that typhoid fever was not present until the discharges from a case living

on one of the little runs which empties into the Potomac about two hundred feet above the pumping station found their way into the city water supply. Such instances could be recited by the hundreds.

INFECTED SELTZER WATER.

Helwig reports an outbreak at Mayence in 1884, which was traced to the use of artificial seltzer water, the water having been obtained from a well polluted with typhoid dejecta.

INFECTED WELLS.

Breumer presents the medical history of a farm, showing for twenty-four years the occurrence of typhoid fever, sometimes amounting to an epidemic. During a similar outbreak in 1886 he examined the drinking water, which, though clear and odorless, contained twenty thousand germs per teaspoonful, among others fecal or intestinal bacteria.

An outbreak of typhoid fever at Hirschfelden in 1885 was limited to persons using the water from a well in the vicinity of which the mother of a typhoid patient had been washing the soiled linen and bedding of her son.

INFECTED CLOTHING.

Gelau reports an epidemic which renders it probable that the disease may be communicated by means of infected clothing. A German army regiment, with an average mean strength of three hundred and fifty-three men, between the years of 1883 and 1884, furnished not less than one hundred and forty-six cases of typhoid fever. The water supply was above suspicion, and disinfection of the quarters and even abandonment of the barracks failed to check the disease. This finally led to the suspicion that the clothing might be the source of infection, especially as the garments were promiscuously worn. Examination revealed the presence of fecal spots in a number of pantaloons. The clothing was disinfected, after which only three mild cases appeared, and these were confined to the men engaged in the disinfection.

INFECTED HANDS.

There are of course a number of instances on record in which the disease was contracted by washerwomen, nurses, and persons engaged in the removal of night soil containing typhoid stools, and the most probable explanation is that in the majority of these cases the virus was conveyed to the mouth by means of infected fingers.

Professor Finkler, of Bonn, a very competent observer, believes that the disease may be communicated by intimate contact, living in the same room, or breathing the same air, and accounts in this way for a number of outbreaks in his section. In 1886 a woman who had been called to one hamlet to nurse her children returned to her home, was taken sick with typhoid fever and communicated the disease to her nurse, and subsequently fifty other cases developed which could not be traced to soil pollution or infected water supply. From this locality three children were admitted to the hospital at Bonn; here four persons were attacked who had come in direct contact, and five washerwomen who had come into indirect contact, *i. e.*, through the clothing and linen of the patients. I have found similar instances in my present investigation, but it is practically impossible to say

whether in these cases the germs were conveyed through the fingers or through the air, or by means of flies infecting the food. Pfuhl, a German military surgeon, has recorded an observation which renders it probable that typhoid fever may be contracted by bathing in polluted streams.

RELATION TO WATER SUPPLY.

The death rate of a community may fairly be taken as an indication of the character of the water supply. It is true typhoid epidemics have been traced to other sources than water, but observation and experience have demonstrated that contaminated and polluted water is the most prolific cause.

In cities provided with good systems of sewers and pure water, epidemics of typhoid fever are quite rare.

"Perhaps no more impressive illustration of the effectiveness of pure water can be given," says Thomas B. Carpenter,* "than the remarkable cholera epidemic in Hamburg in 1892, which so startled the civilized world, and the comparative freedom of Altona from the disease. Both cities are in close proximity to each other. In fact they merge one into the other, and no boundary exists. Both empty their sewage into the Elbe and both draw their water from the same stream, Hamburg taking it from a point above both cities and Altona below. During August, 1892, a band of Russian gypsies encamped on the banks of the Elbe and the excrement of one of its members, subsequently found suffering from cholera, was emptied into the river. There speedily followed an epidemic of the disease in Hamburg, with a total number of cases of seven thousand four hundred and twenty-seven and nine thousand three hundred and twenty-one in August and September, respectively. During the epidemic there occcurred seventeen thousand and twenty cases with eight thousand six hundred and five deaths. Hamburg delivered water to its inhabitants with practically no purification, followed by the above disastrous results. Altona, although deriving its supply from the same river, and immediately below both cities, after receiving the sewage of almost eight hundred thousand people, escaped the epidemic with but comparatively few cases, and these were largely imported. Needless to say Altona filtered its water before delivery.

In 1893 a filter plant was installed in Hamburg, and the death rate from typhoid fever, which in 1894, when the source

*Bacteriologist of Department of Health, Buffalo, N. Y., in *Albany Medical Annals*, April, 1897, p. 149.

of water supply was the same as in 1892, was 21⅝, was reduced to six per one hundred thousand in 1894."

The following table given in the *Albany Medical Annals*, April, 1897, shows the influence of proper methods of water purification upon the death rate from typhoid fever:

CITIES.	Typhoid mortality 1890 to 1894, inclusive, per 100,000.	WATER SUPPLY.
The Hague	4·9	Filtered from sand dunes.
Rotterdam	5·2	Filtered from River Maas.
Christiana	6·8	
Dresden	6·9	Filter gallery, River Elbe.
Vienna	7·	Springs in the Schneeburg.
Munich	7·1	Springs, Mangfall valley.
Copenhagen	7·9	
Berlin	8·	Filtered, Lake Tegel and River Spree.
Breslau	11·6	Filtered from River Oder.
Amsterdam	13·9	Filtered from Haarlaem Dunes.
Stockholm	14·3	
Brisbane	14·3	
London	14·6	Kent wells, filtered from Thames and Lea.
Edinburgh	15·8	Filtered from reservoir in Pentland hills.
Trieste	17·	
Brooklyn	19·	Impounded and wells.
Des Moines	20·2	Gallery system, natural filtration.
New York	20·4	Inpounded from Croton and Bronx rivers.
Davenport, Ia	21·4 (1895-26)	Mechanical filtration from Mississippi.
New Orleans	21·4	Rain water from tanks and cisterns.
Sydney	21·6	Impounded from upper Nepeau.
Hamburg	21·8 (1895-6)	River Elbe (filtered since May, 1893).
Budapest	22·4	Ground water from wells.
Glasgow	22·8	Lake Katrine.
Brussels	26·2	
Paris	26·4	Rivers Seine, Marne, Vanne and Ourcq canal, wells, etc.
Manchester	27·6	Lake Thirlmere.
Venice	30·2	
Milwaukee	32·	Lake Michigan.
Rome	32·2	Fontanadi Trevi, Acqua Felice and Paoli.
Boston	32·6	Lake Cochituate and Sudbury rivers.
Detroit	33·8	Detroit river.
Dayton	36·	Driven wells.
Turin	36·8	
Liverpool	37·	Lake Vyrnwy.
Buffalo	39·2	Niagara river.
Providence	39·2	Pawtuxet river.
Covington	39·4	Ohio river.
San Francisco	40·2	
Prague	43·2	
Minneapolis	45·4	Mississippi river.
Baltimore	45·8	Lake Roland and Gunpowder river.
Newark	45·8	Inpounded from Pequannock river since April, 1892.
St. Louis	47·	Mississippi river.

CITIES.	Typhoid mortality 1890 to 1894, inclusive, per 100,000.	WATER SUPPLY.
Newport, Ky	47·5	Ohio river.
Philadelphia	48·2	Delaware and Schuylkill rivers.
Denver	48·3	South Platte river.
Cleveland	49·2	Lake Erie.
St Petersburgh	52·3	Filtered from River Neva.
Cincinnati	52·4	Ohio river.
Moscow	57·	Springs ponds, Moscov and Yauzi rivers.
Toronto	57·8	Lake Ontario.
Quincy, Ill	58·	Mechanical filtration from the Mississippi river.
Dublin	58·8	Filtered from River Vartry.
Knoxville	61·9 (1895-59)	Mechanical filtration from Tennessee river.
Milan	62·	Passaic river.
Jersey City	75·	
Washington	76·6	Potomac river.
Louisville	79·4	Ohio river.
Chattanooga	80· (1895-48)	Tennessee river.
Chicago	84·	Lake Michigan.
Pittsburg	91·7	Allegheny river.
Lowell	92·4	Driven wells and Merrimac river.
Atlanta	92·8 (1895-43)	Mechanical filtration from Chattahoochee river.
Lawrence	96·2 (1895-48)	Natural filtration from Merrimac river since 1893.
Alexandria	162·4	Nile.
Cairo	189·4	Nile.

It is very noticeable that those cities having pure water supplies, Munich and Vienna, from mountain springs; Frankfort, Copenhagen, Dresden, from ground water; The Hague, Berlin, Rotterdam, Breslau, Hamburg, Zurich, London, whose waters are filtered, even though in some cases the raw waters are badly sewage-polluted, have very low death rates from typhoid fever.

Another noticeable feature of this report is the difference in mechanical and natural filtration. Davenport and Quincy get their water from the Mississippi, not many miles apart. Des Moines has the gallery system and natural filtration. Its actual annual death rate for the period given was 16⅝, representing a population of 75,000.

An interesting instance of the effect of the purification of the water supply is shown in the cases of Jersey City and Newark, N. J. These two cities are practically under the same climatic and geographical conditions, being separated by the Jersey Meadows. Previous to April 15, 1893, both Jersey City and Newark took their water from the Passaic river, into which

goes a great quantity of sewage. Up to that time the annual death rates from typhoid fever were as follows:

	1890.	1891.	1892.
Jersey City	9 1/10	9 5/10	5 5/10
Newark	6	8 1/10	4 5/10

In April, 1893, Newark began using Pequannock water from a water-shed unexposed to pollution, while Jersey City continued to use the Passaic water. A diminution in the death rate from typhoid fever to one-fifth of its former proportions took place in Newark, as shown below:

	1893.	1894.
Jersey City	6	7 6/10
Newark	2 8/10	1 5/10

Pertinent to the foregoing table, which offers much for careful consideration, is a paper by James H. Fuertes, Civil and Sanitary Engineer of New York City, prepared for the Civil Engineers' Association of Cornell University, 1896, giving the sources of water supply of the leading cities named in the table:

"It is possible, in a general way, to see that in those cities whose waters are polluted to greater or lesser degrees the typhoid death rates increase directly with the degree of pollution. For instance, in those using the raw river waters which flow through populous districts the death rate is uniformly higher than that of any other class, modified only by external influences, such as in the case of New Orleans, where the river is of enormous volume, carries large quantities of silt that aids sedimentation, and flows through an almost uninhabitated territory for many leagues above the city. So much for statistics. Now it will be interesting to see where a few of the large cities of Europe with which travelers are most acquainted obtain their drinking water.

SOURCES OF WATER SUPPLY OF SEVERAL LARGE EUROPEAN CITIES.

Amsterdam drinks water collected in open canals of a total length of about fifteen miles, cut through the sand dunes. The iron which is dissolved in the water is deposited in the canals and the water is then again filtered before delivering it to the city. The typhoid fever death rate at Amsterdam is about twelve per hundred thousand per year.

Antwerp is supplied with water filtered from the tidal river Nethe, which is at times polluted by the sewage of Brussels and that of other small cities. Owing to its origin and to the muddy banks of the stream it is quite turbid and stained and of a disagreeable taste. The objectionable qualities are all removed by treatment with metallic iron in Anderson's Revolver Purifiers and a subsequent filtration. This process, which s closely watched by the city authorities, is said to be efficient.

Berlin and its suburbs have many water supplies, but all are so treated a to bring them practically to the same standard of purity. Some come rom ground water and some from the Rivers Spree and Havel. All the

water is filtered. The water that is furnished to the suburbs of West End, Charlottenburg, Schoeneberg, Friedenau, Steglitz, Wilmersdorf, Schmargendorf, Kolonie, Gruenewald, Zehlendorf, Wannsee, Halensee, Grand Lichterfelde, Suedende, Lankwitz, Tempelhof and Rixdorf, with a total population of two hundred and twenty thousand, is obtained exclusively from ground water from two plants, the Wannsee works and the Teufelsee works in the Gruenewald. This water contains iron in solution, which is removed by letting it fall through selves on a bed of coke, and then, to remove danger of other pollution, it is all filtered through sand filters before being sent to the city.

The suburbs of Lichtenberg-Freidrichsberg, Boxhagen-Rummelsberg, and Freidrichsfelde, on the east side of Berlin, with a population of about fifty thousand, are supplied with ground water from the southeast of Friedrichsfelde, treated similarly to that above described. The first water works which supplied Berlin, outside the Stralauer Thor, were opened in 1856 but are not now in use. The present supply of the city proper is furnished from two works, those on the Tegelsee, to the northwest of Berlin, an enlargement of the River Havel, which supplies one-third of the water to the city, and those on the Mueggelsee to the southeast, which supplies two-thirds of the water. At each one of these the water is taken from the lakes directly, filtered and pumped to large reservoirs, from which it is again pumped to the distributing pipes. The quality of the water is excellent, and the health records of the city show that the typhoid fever death rate in recent years has been very low, and was only four per hundred thousand in 1894.

Brussels, the beautiful capital of Belgium, with two hundred thousand inhabitants, uses water from a system of conduits nearly five miles long, which are a hundred feet below the surface of the ground, under a forest used for a city park. The suburbs, however, are not so well supplied; and serious studies are being made in view of the demands of the probable "greater Brussels" of the near future. The plans presented favor either an extension of their present system in another locality, or the securing of a new supply of water from a more distant source.

The water which is supplied to Copenhagen is drawn from the ground by driven wells over a large territory lying principally to the northwest of the city. The death rate from typhoid fever in the city is about seven per hundred thousand inhabitants per year.

Dresden, the art center of Germany, has very good water, derived from an underground supply along the banks of the Elbe to the west of the city. The water comes from the Stadtwald, a large uninhabited forest on a hill, owned by the city. It percolates through the ground and finds its way finally to the banks of the Elbe, where it is collected by a line of perforated pipe nearly a mile long and pumped to the city reservoir. Since the present supply is not as large as they need, they are about to build another set of works further up the river, upon the same principle, but with slightly different details. The excellent quality of the water is attested by the low death rate of seven per hundred thousand per year from typhoid fever.

The water used in Edinburgh is brought from the Moorfoot and Pentland Hills and is filtered before delivering it to the city pipes to remove the discoloration it acquires from the vegetation on the gathering grounds. As

coloration it acquires from [illegible]

the supply from these sources is nearly taxed to its utmost to supply the growing city, they are constructing an additional supply that will be brought from the Talla, a branch at the head waters of the River Tweed, thirty-two miles from the city. The water of Edinburgh is very soft and of an excellent quality.

Frankfort-on-the-Main gets its water partly from springs, and partly from ground water which is collected under a large primeval and uninhabited forest owned by the city. It is on the Sachsenhausen side of the Main, opposite Frankfort, near Schwanheim. The permanent level of the ground water is about fifteen feet above the river at the works, so that there is no possibility of contamination. The water for street sprinkling is taken from the river and is entirely separate from the drinking water. The death rate in Frankfort from typhoid fever in recent years has been about six per hundred thousand per year.

Geneva, Switzerland, in Roman times, and in the middle ages, was supplied by aqueducts which brought spring water from the hills and mountains. Traces of these aqueducts still exist; but the supply is now drawn from the Lake of Geneva, at a point outside the harbor, about fourteen hundred feet from the shore, and forced into the city, both for domestic use and for power for manufacturing purposes. Large pumps actuated by turbine wheels, are driven by the dammed up water of the Rhone as it issues from the foot of the lake, to perform this service. The waste waters from the city are prevented from going into the lake by large sewers built along the banks of the river and of the lake, which intercept the foul waters and discharge them into the Rhone below the pumping-station. During the summer season one of the attractions of this beautiful place is the fountain of the water works, a single jet of water thrown vertically from a large nozzle in the harbor to a height of about two hundred feet. In the evening it is illuminated by colored lights refracted through the stream, which makes it stand out in bold relief and brilliant colors against the dark background.

Genoa is provided with water by three aqueducts, which bring the waters of small mountain streams to the city, and like all supplies derived from surface gathering grounds, are, most of the time, very good; but are subject to pollution if not given the most intelligent supervision and watchfulness. The cholera* of 1884 in Genoa was attributed to the infection of the waters of the Scrivia, which supplies the Nicolay aqueduct through filter galleries, by the throwing of the wash water of the linen of choleraic patients in the small hamlet of Busalla, into a tributary of the Scrivia, through which it found its way into the city. Cholera appeared in Genoa six days after the pollution of the water.

Glasgow uses the waters of Loch Katrine in the highlands thirty miles away, which are brought to the city in two aqeducts. The city secures the lake against pollution by having entered into agreements with the proprietors of the lands adjoining, whereby it may at any time, if it be deemed necessary, construct such works as shall protect the lake against pollution, which works shall be maintained at the proprietor's expense; and they have also held them under bonds not to construct nor allow the construction of any more houses in the water shed of the lake, nor to rent the land for building purposes.

*Spataro "Igiene delle Acque," 1891, page 70.

Hamburg is now supplied with the filtered water of the Elbe. The filters have been completed since the epidemic of cholera in 1892. They were put in operation in May, 1893. Examinations are made constantly of the water as it goes to the city from each filter, and the closest possible watch is kept over the result. When it is realized that there are on the Elbe, many large cities above Hamburg, which discharge their sewage into it, with an aggregate population of over six million people, and that at Hamburg it is subject to tidal influences, the exceedingly low death rate from typhoid fever of six per hundred thousand in 1894, after the filters were put in operation, is an indication at least of a decided change for the better, since previous to that time the rate for several years had been in the neighborhood of twenty-eight

Heidelberg has very good water from two sources. The old supply comes from two springs, the Wolfsbrunnenquelle, developed in 1873, and the Rombachquellen, developed in 1876 Several years later, a driven well about one hundred and fifty-seven feet deep, was put down a quarter of a mile above the Marktplatz in the valley of the Neckar, which yields water of the same quality as the spring water.

Leipsig uses ground water collected in perforated pipes driven about thirty-five feet deep into the gravel subsoil in Staatswalde, near Naunhof.

Liverpool goes into the heart of Wales for its main supply, by throwing an enormous masonry dam across the valley of the Vyrnwy river, thus forming a lake eighty-four feet in depth at the deepest place. The water is yellow, as are many of the surface waters of England, but it is filtered at Oswestry, nineteen miles from the dam, which operation removes the greater part of the discoloration. In addition to this supply, they have wells sunk into the new Red Sandstone, with reservoirs and filter beds at Rivington, about twenty miles from Liverpool, and fifteen from Manchester.

London with a population of nearly six million gets its water from many sources, and in 1890, distributed to the people not less than seventy-seven billion eighty-six million gallons of water. To give a concrete idea of what this enormous quantity means, one must imagine that it would be sufficient to fill a reservoir that would cover a whole congressional township, or thirty-six square miles to a depth of eleven feet. Scarcely half of this supply is taken from the Thames, about thirty-eight per cent comes from the Lea, and the remainder from springs and wells. All the water which is drawn from the river is filtered, and special supervision is given by the Conservancy Boards over the sewage disposals methods of the various towns in the water shed of the river, to prevent pollution. The typhoid fever death rate of the district supplied with the well water and of those supplied with filtered river water, is to-day about the same and averages about fourteen per hundred thousand per year.

Manchester is supplied by surface water from two sources. The old supply from the Longdendale Impounding reservoirs, about fourteen miles east of the city, and the new supply, which is brought in an aqueduct seven feet in diameter from Lake Thirlmere in Cumberland county, ninety-five miles north of Manchester. Previous to the introduction of the Thirlmere supply the typhoid fever death rate for four years had been nearly constant and in the neighborhood of thirty per hundred thousand per year. In 1894, the Thirlmere water was introduced and the typhoid death rate for that

year is given at eighteen per hundred thousand. To protect the purity of the water, Manchester has, at great expense, purchased absolutely, the whole area of the tributary water shed.

Marseilles, on the Mediterranean Sea, is supplied by an aqueduct taking its water from the River Durance. The work was undertaken in 1837 and finished in 1848, under the direction of the Engineer Montricher. The source is near the Suspension Bridge of Pertuis, on the Durance, about fifty-two miles from Marseilles. At the point where the line of the aqueduct reaches the valley of the Arc it crosses on a masonry structure of great beauty, called the Aqueduct de Roquefavour. It is about a quarter of a mile long and two hundred and seventy feet high above the waters of the river. It presents the appearance of three bridges, one above the other, like the Pont du Gard, the ancient Roman aqueduct of Nimes, ascribed to Agrippa 19 B. C., but it is very much higher and longer than the latter. On reaching Marseilles the water flows into a large reservoir, which is arched over and covered several feet deep with earth, shrubs and tropical plants. The front of the reservoir exhibits a magnificent fountain under the arch between the two wings of the Palais de Longchamp. One of the most serious defects in this copious water supply is that the aqueduct is open at the top in several places, and is thus made susceptible to pollution. In Marseilles, epidemics of intestinal diseases have been attributed to this fact *

Munich, like Vienna, is fed by springs from the foot of the mountains. Munich, more than any other large city in the world, has probably the best right to boast of her water supply, for not many years ago it was the seat of frequent fearful epidemics of typhoid fever and other diseases, while owing to sanitary improvements the typhoid death rate in 1894 was only two and a half per hundred thousand per year.

The springs, of which there are many, are developed by making tunnels under the gravel hills that yield the water, and connecting them with an aqueduct that leads them to the city, thirty miles distant. The water which feeds the springs probably comes from the Tegernsee,† a lake in the foothills of the Alps, some miles distant, which slowly filters out through these gravel hills deposited by glaciers, and appears as springs in the Mangfall Thal. The water, however, is very hard. I was shown a stalactite, one-half inch thick, six inches wide and two feet long, which had formed in two years in one of the new tunnels. In this same valley there occurs a curious transformation which was brought about by the hardness of the water. A small spring, a great many years ago, was improved by a farmer by placing a wooden trough so that its waters could run to waste through it to a ditch. The trough was made of a hollowed-out log. The lime in the hard water was gradually deposited on the log and the log gradually rotted away until now the wood has apparently entirely disappeared, and the water runs out of a stone log

Nuremberg also uses ground water taken from the fine sand underlying a valley about ten miles east of the city. The sand which bears the water is so exceedingly fine that ordinary perforated pipes driven into it would soon fill up with sand, and they were obliged to resort to an ingenious expedient to avoid this danger The method adopted was to sink first, at the point where the well was to be located, a thin sheet-iron cylinder, of several times the diameter of the tube which was to serve as a suction pipe. Inside of this large cylinder, at the bottom of the hole, they placed a concrete sole piece, entirely filling the cylinder at the bottom. Then inside of this cylinder they placed several smaller ones, each one within another, and all resting on the sole piece in the bottom The central cylinder is the perforated suction pipe connected with the pumps. In the annular spaces between these different cylinders were placed different sizes of sand and gravel, having the finest sand on the outside spaces, and then the coarser ones successively toward the center. The sheet-iron cylinders were then withdrawn.

Paris has several water supplies for different purposes and from different sources. That which its two and a half million people drink comes from springs, of which the Moulin de la Source, the headwaters of the Dhuis, and Le Bime de Cerilly, in the valley of the Vanne, are the principal ones. These are very large and beautiful springs The Moulin de la Source yields daily about five million gallons, and Le Bime de Cerilley about half as much. The total quantity taken from the valley of the Vanne is about twenty to twenty-five million gallons per day. Besides these there are several artesian wells and springs which are in use and others are in course of preparation. Some of the suburbs, however, use river water. The typoid fever death rate of twenty-five per hundred thousand per year may, perhaps, be ascribed to the fact that the greater mortality rate amongst those using the river water may influence the rate of the entire city. As a recent plant for the purification of the river water used by certain suburbs has just been installed the results will be watched with interest.

No city of the world has been so famed in all ages for its water as Rome. Since 312 B. C. this city has been supplied with the water of springs and rivers and lakes brought within its walls from great distances. The Aqua Claudia, whose ruined arches stretch across the Campagna, has been the admiration of generation after generation since its completion in 52 A. D. by the Emperor Claudius. The waters, which for centuries it brought to Rome, were gathered from two springs in the Sabine mountains near the headwaters of the present Aqua Marcia. The course of this aqueduct to the city was circuitous, being forty-five miles in length, nine and a half of which were on arches across the Campagna.

The Aqua Marcia, which was built by Quintus Marcius Rex B. C. 144, was thirty-eight miles long, and brought its water from springs in the Vale d' Arsoli beyond Tivoli. In 1869 and '70 the sources of this ancient aqueduct, after having been lost for centuries, were rediscovered and the water brought to the city again by Pope Pius IX, most of the way in iron pipes, and known to-day under the name Aqua Pia.

The Aqua Virgine, which was built by Marcus Agrippa, 19 B. C., to supply his baths, the ruins of which are still to be seen against the back of the Pantheon, brings into the city daily about sixteen million gallons of water from springs in the Vale di Salone, fourteen miles away. The termination of this aqueduct is at the beautiful fountain of Trevi, whose water is drunk by travelers leaving Rome, in the hope that it will insure their return "some day."

* Association Francaise pour l'Avancement des Sciences, September 1891, Marseilles.

† Mittellungen ueber die Wasserversorgung München—Carl Pevc., Munich, 1895.

The Aqua Felice, a restoration made in 1586 under Pope Sixtus V, of the ancient Aqua Alexandrina, built 226 A. D. by Severus Alexander to supply his extension of the baths of Nero, brings water from springs in the Alban mountains, about fourteen miles from Rome, between Gabii and Lake Regillus, and terminates in a fountain near the Piazza delle Terme.

The Aqua Paola was the ancient Aqua Trajana, built by Trajan in 110 A. D. and restored under Pope Paul V in 1611. Its termination is at the beautiful fountain on the Janiculum Hill, behind the church of San Pietro in Montorio, near the site of which St. Peter is said to have been crucified head downwards It brings the water from springs and from the Lago di Bracciano, more than thirty miles distant.

Southampton is supplied with water drawn from deep wells and galleries sunk in the clefted chalk formation near Otterbourne. The water as it is taken from the wells is very hard, about twenty degrees by Clark's scale, and before delivery to the city it is reduced to about six degrees by a treatment which removes the mineral compounds it has dissolved from the rocks.

Stuttgart is supplied with water partly from a spring called the Heidenklinge, but as it is rendered turbid by rains and melting snow in Winter they use a small filter at such times to clarify it. The rest of the supply is obtained from the filtered water of the river Neckar.

Venice was formerly supplied with rain water stored in cisterns, but in 1890 a system of water works was established near Castel Franco, about twenty-five miles from Venice, from which they now supply the city with ground water of a very good quality from deep wells. The yearly death rate from typhoid fever is about twenty-five per hundred thousand.

The water supply of Vienna, one of the purest in the world for a large city, is derived mainly from two large springs, the Kaiser Brunnen and Stixensteiner Quelle. The former is one of the most celebrated springs known. It lies in the Hoellenthal between Schneeberg and Raxalpe, above Hirschwang. Its waters are derived from the snow upon the greater part of the Schneeberg, which percolate through the porous and clefted rocks of the mountain, appearing here in a stream which ordinarily yields about two hundred gallons per second. With this beautiful water, fed by unpolluted snows, the death rate in Vienna from typhoid fever is about seven per hundred thousand persons per year.

At Zurich, drinking water is drawn from the Lake of Zurich, at a point quite out into the lake, and about thirty feet below the surface. It is then taken to the filters, of which there are seven in use and three new ones in construction, each about sixty feet wide and a hundred and twenty feet long, roofed over with concrete arches. The water is filtered through sand about three feet in depth and then pumped to a covered reservoir on a hill above the town for distribution to the city. The filters were first put in operation in 1886. For the six years before, the death rate from typhoid fever, which had been increasing, averaged sixty-nine per hundred thousand per year. For the six years after they were operating, it averaged about ten; this reduction, the authorities attribute to filtration.*

Many lessons can be learned from a study of these very brief descriptions if space would permit a digression into the different fields of inquiry. A few facts, however, may be commented on. In the first place, it is noticeable that most of the large European cities have spared no legitimate pains nor expense to secure uncontaminated supplies if possible. That when this has been impossible or impracticable for physical or financial reasons, they have spared neither pains nor expense to reduce the danger entailed from the use of such water as they could obtain. A comparative exhibit of the relative purity of untreated waters from different sources, as indicated by the typhoid fever death rates, seems to show, as our judgment would suggest, that the purest are those from springs and ground water in unpopulated districts whose sources are beyond the possibility of pollution; that the next in purity are the waters collected from large surface-gathering grounds, either in natural or artificial lakes, whose water sheds are protected against pollution as much as possible; that next come supplies from running streams where there may be a pollution at a distant point, the effect of which is modified by dilution and sedimentation, and that the most impure water supplies are those obtained from rivers or lakes whose waters are subject to pollution with the wastes of cities near the point where they are abstracted for use.

*Licht und Wasserwerke Zurich, 1892.

But the most gratifying and important lesson is, that these statistics show that it is possible to take waters of the poorest quality and by intelligent treatment make them safe for use. These are not laboratory experiments made under theoretically perfect conditions. They are results actually obtained, often under adverse conditions, with large plants, in large cities, in different lands, among different peoples and under different climatic conditions.

It is well known that during the months of August, September and October typhoid fever prevails the most generally. The climatic condition of the preceding Summer has a notable effect upon the disease. This was demonstrated to a marked degree in the Autumn of 1892, when the disease was unusually prevalent over the entire country, the death rate being also very high, as a consequence of the preceding dry, hot Summer, when wells, rivers, lakes and streams were very low.

TYPHOID FEVER IN THE COUNTRY.

There are in the rural districts many cases of typhoid fever every year. A very probable source is in typhoid stools which have not been thoroughly disinfected, and deeply buried, but thrown upon the frozen earth in Winter, and in the following Spring washed into sources of water supply.

Blythe, in his *Manual of Public Health* (page 508), says: A constant series of cases of typhoid fever occurring regularly in the Autumn among children would indicate the infection of the soil; for, as is well known, children sit about upon the ground, continually have earth-soiled hands, and in this way contaminate their food."

LABORATORY DIAGNOSIS OF TYPHOID.*

While the method of making the Widal test for typhoid fever has been found to be necessarily more complicated than was at first supposed, nothing has been found to disprove its great value. As the discovery of the bacilli of tuberculosis has materially changed our views of consumption and, by rendering its recognition possible in its incipiency, placed it among the curable diseases, so the Widal reaction in typhoid fever shows a greater diversity in the manifestations of this disease than was formerly recognized. Cases are now classed as typhoid which in the absence of this test would not be so regarded. That typhoid fever can now be recognized when the clinical symptoms are insufficient to establish a diagnosis is a fact the value of which can hardly be overestimated, for it is the mild class of cases that are potent factors in the perpetuation and spread of the disease. While the early diagnosis of a case that would subsequently prove severe is of value to the physician in directing his treatment, the positive diagnosis of a mild case is of equal importance, as such restrictions can then be placed upon the patient as to prevent contamination which might give rise to other and more severe cases.

Every case of typhoid has its origin in some previous case which, through the media of food or drink, has brought about infection. It is therefore evident that any means which enables the physician to reach a positive diagnosis in a greater number of cases will at the same time be the means effectual in reducing the number of cases. We now have in the serum reaction a method of establishing a diagnosis in both mild and severe cases. Few physicians, however, are prepared to make the test, but as the quantity of blood required is small, and not impaired by drying, the examinations can be made and reports furnished by distant laboratories.

In collecting blood for this purpose the following simple directions are to be complied with: Cleanse the tip of patient's finger and puncture lightly with a sterilized needle, allow a few, five to ten, drops of blood to fall separately on an ordinary piece of glazed writing paper, allow to dry without heat, fold and mail in an ordinary letter. *No trace of antiseptic material of any kind should be on finger or needle in procuring the blood.*

Without entering into a detailed discussion of the laboratory technique, the examination may be briefly described as follows:

*By Eli Grimes, M. D., Bacteriologist of the State Board of Health.

To a drop of dried blood is added a drop of bouillon and the two thoroughly mixed; a drop of this mixture is placed on a cover glass and a drop of bouillon culture of typhoid bacilli added. This is now examined as a hanging drop in a moist air cell under the miscroscope. If the bacilli show no cessation of motion nor agglutination the case is probably non-typhoid, and if another specimen be examined with the same result typhoid fever can safely be excluded from the diagnosis. But when the bacilli exhibit a marked decrease of motion with agglutination, the examination must be continued, as typhoid is strongly indicated but not established. The further examination now consists in making a series of dilutions of the blood and culture, and determining the highest dilution that will give a marked reaction. At the same time a parallel series of dilutions and examinations are made, using blood, similarly prepared and previously tested, obtained from a patient known to have typhoid fever. The object of this last named series of tests is to determine the sensitiveness of the bacilli used, and to obtain comparative results. In some instances blood of non-typhoid individuals give the reaction when in concentrated solution, but not when dilute. It is therefore necessary to exclude these cases by determining the degree of dilution which gives the observed reaction. By means of a Hemo-chronometer the amount of blood in solution is estimated with a sufficient degree of accuracy for this purpose. The reaction is most marked in blood taken when the temperature of the patient is the lowest. This is an important fact to keep in mind in procuring a specimen for examination.

HOG CHOLERA AND TYPHOID FEVER.

The following communication was addressed by Dr. Wright to Dr. J. I. Gibson, State Veterinary Surgeon, and was read by Dr. Gibson before the Board at its meeting held May, 1896.

The Secretary of the Board laid the facts before the meeting of the Iowa State Veterinary Association later, and suggested, as other cases somewhat similar had been reported, that in his opinion there were abundant reasons to believe that water polluted with the excreta of hogs having cholera might produce

typhoid fever or some similar affection in the human subject if the water was drank without being properly sterilized.

Dr. Peters, of Nebraska, thought there was a marked difference between the germs of hog cholera and those of typhoid fever. Whether that is so or not, decency and safety dictate that such water should under no circumstances be used for potable or domestic purposes:

I was called Sunday evening, April 19, 1896, to visit the family of J. C., near Vail, Crawford county. Dr. Glynn, of Vail, had first seen them on the morning of that day.

The father had felt quite sick for more than a week. He was confined to bed on and after the 15th. Had no medicine until the 19th. From the 16th to the 18th four daughters became sick, and were obliged to remain in bed at home. Another daughter, who teaches school in Sac county, having been at home a week, on returning to Sac county, was taken sick at the same time as the others.

Dr. Glynn's record showed the temperature ranging from one hundred and one degrees to one hundred and three degrees Fahrenheit, and pulse about ninety to one hundred, at the morning visit on the 19th. I found in the evening of the same day, temperatures from one hundred and three degrees to one hundred and five degrees Fahrenheit; pulse from one hundred to one hundred and twenty.

The daughters at home ranged in age from fifteen to eight years. The daughter in Sac county is eighteen years old.

All had tenderness over the stomach, but not over the lower abdomen; some nausea; marked headache; stiffness and soreness at the back of the neck; chilly sensations, and markedly red tongue. Two had looseness of the bowels with very foul odor in the discharges. The others afterward developed a fetid diarrhœa.

One grown daughter, and the mother, and a small brother five years old were quite well, and have continued so. Inquiry as to the habits showed nothing unusual eaten or done. But the mother, the daughter and small son were in the habit of drinking tea and coffee — no water. The others all drank water freely. Their well is situated in the lowest point in the hog-yard. Quite a steep and high hill extends from the house to the hog-yard. Last Fall the hogs had cholera — so called. I have seen a good deal of this so-called cholera in that neighborhood. Its symptoms are first, loss of appetite, then constipation, drowsiness, diarrhœa, increasing and fetid, apathy, hemorrhage of bowels, extreme emaciation, death.

This hog cholera is very common in Crawford county, and the wells are often at some low place in the hog-lot. Typhoid fever is quite uncommon, and less so in the country than in the towns. In the last two years there has been a large number of cases, but none at all before within a mile of this farm.

The Woodbridge treatment was used thoroughly with three daughters at home. One of them became permanently free from fever after the fourteenth day She had at first a temperature of one hundred and five degrees Fahrenheit, and pulse one hundred and eight. She had severe diarrhœa. All had free bleeding at the nose, and became quite tympanitic after the first week. Two other girls who took the Woodbridge treatment, became free from fever — one after the twenty-first day, the other after the twenty-fourth day. The father and other daughter at home were much worse than the others, the father being slightly delirious. They began the Woodbridge treatment about the fourteenth day, under which they seemed to improve, the father for three days, the daughter continuously. On the nineteenth day the father had a sudden, severe relapse, and died on the twenty-second day.

The girl who was the sickest developed severely the bronchitis peculiar to typhoid fever. Sibilant rales, and afterward moist rales were quite easily heard all over both lungs. She expectorated freely.

Dr Johnson diagnosed typhoid fever as affecting the daughter in Sac county.

The water in the well above described, when added to sugar, and set in a warm place developed the odor of rancid butter. Ordinarily it smells and tastes like the best water.

Vail, Iowa. W. F. WRIGHT.

SMALL POX

During the biennial period there have been but three outbreaks of small-pox within the State.

July 26, 1895, a case was officially reported from Douglas township, in Clay county. The subject was a male adult who had come from Etnaville, Ohio, arriving July 16th, where he had been exposed to the disease, and was supposed to have been quarantined there. Quarantine was at once established, and the remainder of the family who had been exposed, consisting of one adult male, one adult female, and a babe, were vaccinated. On the 28th of July the male adult developed variola, followed by the female August 8th, and the babe August 24th. All recovered except the babe, who died September 4th, from pneumonia, caused by taking cold. Quarantine was released September 18th. The attending physician states that the disease was greatly modified by the vaccination. The original subject claimed to have been vaccinated thirty years prior.

AT DAVENPORT.

In June, 1895, Dr. Cantwell, health officer for the city of Davenport, reported a suspected case of small-pox, the subject being an adult male person. He was immediately sent to the isolation hospital, and restrictive measures at once applied.

The disease proved to be varioloid in mild form, and passed to rapid recovery. The source of infection could not be determined. There were no other cases.

AT DUBUQUE.

August 29, 1895, Dr. Wieland, health officer of the city of Dubuque, reported the case of a man employed on a river boat, who came ashore sick and was sent to the marine hospital, where varioloid was soon developed. He was removed to an isolated place, and the people on the boat, the family where he had stopped, and those who had been exposed at the hospital, were promptly vaccinated and the necessary measures adopted to prevent further infection, and there were no other cases.

PREVENTION—VACCINATION.

There is no part of this subject that is of so much practical importance to the public as immunization. The Jennerian procedure has become so firmly established that it would be a work of supererogation here to seek to affirm it.

The Report of the British Royal Commission on Vaccination which has recently been made public may be regarded as a complete vindication of the claims of vaccination to be prophylactic against small-pox. This gratifying result has been arrived at after years of patient labor over various lines of research. History, experience and statistics combine in the commissioners' report to make manifest the protective influence of vaccination. It is admitted that in a certain—happily a small—proportion of the cases accidents do occur. Erysipelas and inflammation, leading sometimes to gangrene and death, have supervened among the poorest and worst situated patients. The recommendations of the commissioners are fairly radical, and if adopted by parliament will almost amount to an absolute reversal of the policy hitherto pursued by the local government board in this matter. That policy can be summed up in two articles of faith—first, the use of arm-to-arm vaccination; second, the encouragement of public vaccinators and public vaccination stations. The bitterness which the poorer classes feel against public and compulsory vaccination is intense; so much so that magistrates can rarely be found to inflict any penalties on parents who disbelieve in it. The commissioners recommend, above all, the use of calf lymph; they advise that the doctor should go to the patient instead of the child being

brought to the station, and that the State should see to it that a supply of calf lymph is within the reach of every vaccinator.

After reviewing all the evidence the Commission find:

1. That vaccination diminishes the liability to be attacked by the disease.

2. That it modifies the character of the disease, and renders it less fatal and of a milder type.

3. That the protection it affords against attacks of the disease is greatest during the years immediately succeeding the operation of vaccination. It is impossible to fix with precision the length of this period of highest protection. Though not in all cases the same, if a period is to be fixed, it might fairly be said to cover a space of nine or ten years.

4. That after a lapse of the period of highest protective potency, the efficacy of vaccination to protect against attack rapidly diminishes, but that it is still considerable in the next quinquennium, and possibly never altogether ceases.

5. That power to modify the character of the disease is also greatest in the period in which its power to protect is greatest, but that its power thus to modify the disease does not diminish as rapidly as its protective influence against attacks, and its efficacy during the latter periods of life to modify the disease is still considerable.

6. That re-vaccination restores the protection which lapse of time has diminished, but the evidence shows that this protection again diminishes, and that to insure the highest degree of protection which vaccination can give, the operation should be at intervals repeated.

7. That the beneficial effects of vaccination are most experienced by those in whose case it has been thorough. It may be fairly concluded that where the vaccine matter is inserted in three or four places it is more effectual than when in one or two places only, and that if vaccination marks are of an area of half a square inch, they indicate a better state of protection than if their area be all considerably below this.

The Commission believes that there is no evidence to substantiate the statement that vaccination has increased the mortality from tabes mesenterica, scrofula, pyemia, bronchitis, diarrhœa, and skin diseases. The possibility of infection with syphilis and erysipelas is acknowledged, but the sum total of the real dangers of vaccination is insignificant when compared to the enormous good of vaccination.

NOTES FROM THE EPIDEMIC IN CHICAGO.

The following is reproduced from the report of the Health Department of the city of Chicago, in May, 1897:

On the sixth of March Charles Griffin, colored cook on an excursion dining car, arrived in Chicago from the City of Mexico via St. Louis and Toledo. He was not discovered by the department until the night of March 11th, when he was found in an advanced pustular stage of small-pox. He was, therefore, obviously in a contagious condition in Toledo and possibly so while in St. Louis. He and his wife—who had nursed him during the preceding five days, living in one room—were at once removed to the Isolation Hospital, where he died four days later, March 15th. He had never been vaccinated, nor had his wife previous to this exposure. She was vaccinated daily until the fifteenth when "it took well," but small-pox developed on the seventeenth—the twelfth day after her infected husband reached home.

On April 5th a third case was discovered, which, although in a locality some five miles distant from the Griffin cases, was traceable to these through a colored washwoman. When discovered this case was also in an advanced pustular stage of confluent small-pox, and, notwithstanding immediate and repeated vaccinations, two other non-previously-vaccinated members of the same family were attacked with the disease on April 16th.

April 21st a tramp moulder, who had recently been in St. Louis, Cincinnati, Cleveland and Toledo, arrived at his brother's house in Chicago and remained until May 5th. Two days later, May 7th, the brother and his wife were taken sick and on the tenth the disease was recognized as small-pox. At the Isolation Hospital the man said he had noticed some "pimples" on his brother's face and forehead. The man, who exhibited two good scars from vaccination in infancy, recovered; the woman, never vaccinated, died of hemorrhagic small-pox May 12th.

Positive proof is lacking that the tramp contracted his disease from the Mexican excursion train, but he had recently been in both Toledo and St. Louis; with the former city the excursion train cook is identified; at the latter city a small-pox outbreak—April 20-28—is traced to the exposure of Mexican goods, souvenirs, etc., brought back by the excursionists from the City of Mexico.

There are two points of especial interest in the foregoing history: First, that, notwithstanding hundreds of persons in this city were exposed to these cases, during the highly contagious stage of small-pox, between March 6th—the date of the arrival of the colored cook, Griffin—and May 7th, the date of the removal to hospital of the last cases, only six of those so exposed contracted the disease. This fact seems to illustrate very strikingly the almost perfect vaccinal protection of the population of Chicago and to demonstrate again the wisdom of the old adage concerning prevention and cure and the vital importance of maintaining the present system of continuous, unremitting vaccination—pushed through all available agencies, public and private. Incidentally, in this connection, should be mentioned the thorough-going work of Chief Medical Inspector Dr. Garrott, and his corps of vaccinators. For a number of blocks or squares surrounding each infected house every person was at once vaccinated or revaccinated; nearly five thousand packing

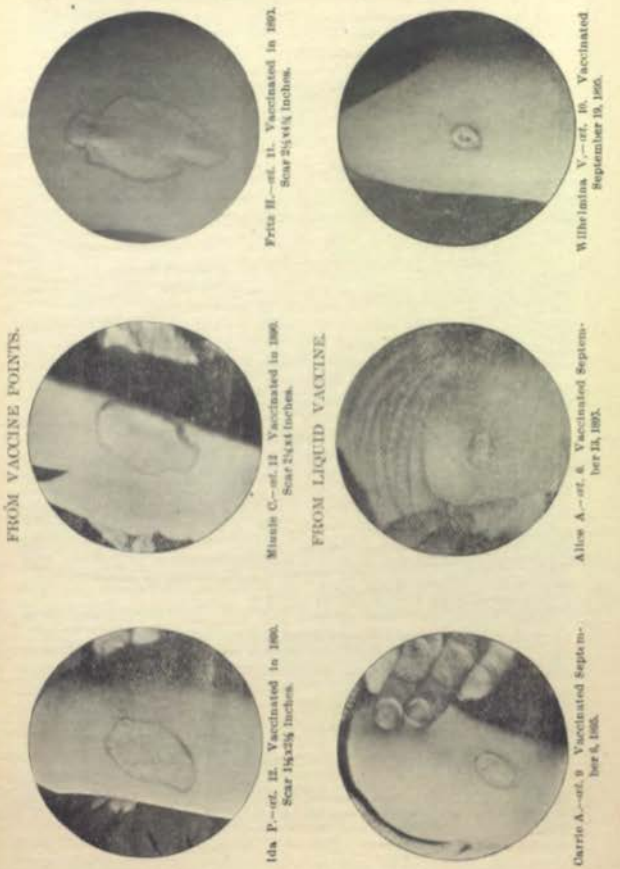
house employés alone were similarly treated, as a result of the third case, which occurred in the packing house district; and a wholesale vaccination of railway employés, especially of the crews of trains running south into Texas and the Gulf states, was secured.

The second point of interest is the result of the use of the glycerinated vaccine lymph—not alone for prophylactic purposes, but as a curative, or at least modifying, agency in the disease itself. All of those exposed were immediately vaccinated without regard to period of exposure or evidence of previous vaccination. With the exception of the woman who died of hemorrhagic small-pox May 12th—first seen May 10th, after twenty days' exposure—the vaccinations proved effective and, in the experienced judgment of Dr. Garrott, materially modified the character of the graver disease. Even in cases not vaccinated until after seven days' close contact with the infecting patient each vaccination for three successive days "took" typically, and the disease was practically aborted—only a few papules and still fewer vesicles appearing, these rapidly drying up and the patient convalescing within an average of seven days. The result has led Dr. Garrott to adopt the practice of daily repeated vaccinations—instead of every second or third day—until "it takes," and to expect modifying effects, even after seven days' exposure—instead of, as formerly, regarding attempts at vaccination as useless after the third day of exposure.

This lymph, adopted by the department in August, 1895, after a systematic bacteriologic and clinic examination of samples of all forms of vaccine then in use, is an emulsion of vaccine lymph in glycerin, stored in sealed glass tubes, each tube containing material for one vaccination. Dr. Gehrmann's experiments show that the period of the contact of the pus bacteria with glycerin necessary to destroy their vitality is from fifty to sixty days. Dr. Garrott's experiments show that the period of efficiency for glycerinated vaccine that can be uniformly depended upon, as determined by primary vaccinations, is from one hundred and twenty to one hundred and fifty days. It is now, therefore, a definite provision that the vaccine delivered to the department for use shall be a sixty-day emulsion in glycerin, supplied in such quantity as that the entire installment can be completely used within thirty or forty days after its receipt.

After nearly two years' personal use, and supervision of the use of upwards of two hundred thousand tubes of glycerinated lymph, Dr. Garrott says: "I have never found any vaccine that was so promptly and uniformly successful in producing typical results. I have noted in using this fluid vaccine a diminution of the usual inflammatory areola surrounding the vaccine vesicles, less constitutional disturbance, freedom from suppurating sores, inflamed glands and lymph vessels, and it produces a more active and typical vesicle than occurs with virus dried upon an ivory or quill point, resulting in regular, uniform, typical cicatrices."

The subjoined illustrations from photographs of vaccinal cicatrices, taken by Dr. C. St. C. Drake during October, 1895, show the difference in the cicatrices resulting from vaccine points and from liquid vaccine:



THE PROPAGATION, PRESERVATION, AND USE OF VACCINE VIRUS.*

Mr. President, Ladies and Gentlemen:

During the twenty-five years that have elapsed since the introduction of true animal vaccination in this country in 1870, the many mooted points regarding it have been thoroughly disposed of by careful observation and experience, so that to-day we can fairly say that we have quite as exact a science in this as we can ever hope for in any branch of medicine. Many observations have been confirmed, many theories have been exploded, but the grand result that has been obtained is this—that all earnest students of the subject now agree that pure animal vaccine virus, transmitted uninterruptedly from one young bovine animal to another, is far superior to all other forms of vaccine. This is true both of the results in individual cases and of the protection afforded to large communities on the advent of an epidemic of small-pox. The large proportion of active practitioners to-day have had but little experience with any form of vaccine other than that taken directly from the animal, or perhaps a few removes from this through human subjects.

To understand clearly the present status of vaccine production, however, I hope that some of you to whom it may be an old story will pardon me if I glance briefly at the various sorts of vaccine that have been employed during the century whose completion we celebrate to-day.

First of all, we have the Jennerian vaccine, viz., the virus taken by Jenner and his contemporaries directly from animals in whom the disease occurred spontaneously, inserted into the arms of human subjects, and carried from arm to arm through a succession of infants down to the present time. This virus is still used in England to some extent, although in recent years, since the establishment of a government institution for propagating calf lymph and of a number of private establishments for the same purpose, it is rapidly going out. In America, this was the vaccine in general use prior to 1870, and when the infants vaccinated were carefully selected and healthy, it was superior to any other sort of virus employed before the systematic production of pure animal vaccine.

Secondly, in several countries there have been cases of cow-pox discovered at different dates during the last sixty years, from which virus was taken and propagated thereafter from arm to arm. This gave a vaccine nearer to the animal than the Jennerian lymph, but in a few years it became indistinguishable from the latter in the vesicles produced and other symptoms.

The great objection to these "stocks" of vaccine has always been that in the course of years their vigor has steadily deteriorated, producing less and less constitutional effect and more and more short-lived vesicles. To counteract this in the case of the Jennerian lymph, more insertions were made in the arms of the patient, often as many as nine in each arm. Even now, from three to six insertions are customary with many European physicians. This is entirely unnecessary with animal virus. My custom is to

*An address delivered before the General Session of the American Medical Association, at the Jenner Centennial Celebration, Atlanta, Ga., May 7, 1896, by Francis C. Martin, M. D., Boston, Mass.

make two scarifications on the left arm or leg, but one typical vesicle is quite sufficient.

I will not weary you with a long dissertation on the dangers of a third form of vaccine, obtained from the variolation of kine, or the serious defects of retro-vaccination – that is, the vaccination of animals with humanized virus. These different forms of virus will always have great scientific interest to experimenters, but we have happily arrived at a stage of vaccine production where we can ignore them as having any important bearing on the practical part of the subject.

Not one of all these varied forms of virus can compare in practical value to-day with true animal vaccine. Perhaps this statement seems rather *ex cathedra*, but I have ample reason, begotten by many years of experience, for affirming its truth. Unfortunately, however, there is no time to enter upon a statement of it here.

True animal vaccination, as we now understand it, originated in this way: On March 28, 1866, a case of spontaneous cow-pox was discovered in a heifer thirty months old, at Beaugency, Department of Loire, France. From virus derived from inoculation from this animal, Professor Depaul, de la vaccine, continued the propagation of pure animal vaccine by inoculation of one young heifer directly from another, at Paris, under the auspices of the Academy of Medicine. Various other cases of spontaneous cow-pox have been discovered from time to time, and with virus from such animals vaccination is now carried on in almost every county in Europe.

The Beaugency stock of virus produced by Professor Depaul was the one introduced into this country by my father, Dr. Henry A. Martin, in 1870. He wrote most indefatigably and used all his efforts unsparingly to secure the adoption of this new method of vaccination; but the results exceeded his most sanguine hopes Within two years the profession had adopted the method enthusiastically and almost universally.

Since that time results have only strengthened the favorable reception accorded to true animal vaccination, and to-day physicians who use humanized virus, even of a few removes, are so rare as to be remarkable. I acknowledge, as regards these gentlemen, that animal vaccine, carried through one remove, viz., through a perfectly healthy child, is an excellent virus. But with every further remove comes greater and greater risk of some imperfection in the child, and so danger to the character of the virus. This danger is by no means so great as is popularly supposed, but it is real and demands consideration.

With ample opportunity to-day of securing pure animal vaccine, I can see no excuse for the use of long-continued humanized lymph. Any serious complaints against animal vaccination can be traced to improper methods of producing or keeping the virus, but can never be fairly made against pure virus, produced honestly and scientifically, and in the best manner.

True animal vaccination is the inoculation of a young selected animal of the bovine species from an original spontaneous case of cow-pox, from this others, and so on, in continuous and endless series, as the source, and the only source, of virus for the protection of the human race against variolous disease. This is the definition given by Dr. Henry A. Martin in his report to this association in 1877, and I cannot improve upon it. It is in accordance with this definition that the Beaugency stock, brought here in 1870,

has been continued constantly up to the present time. I am sure of one point, however, that was still in doubt during my father's life. There is no fetich or charm in any particular "stock" of virus, provided the original case of cow-pox is unquestionable, and provided, too, that the virus is propagated properly and on animals of the right age, continuously from the start. This last matter is of essential importance.

The propagation of animal vaccine, as at present carried on, may be broadly divided into two varieties, viz., the European method, which now obtains very generally throughout Europe, and the American method, or that introduced here by my father and still practiced with some modification by myself.

Various so-called "improvements" of the latter method have been devised by persons of more ingenuity than ingeniousness, which are doubtless "labor saving" and pecuniarily profitable, and which I must presently refer to, but only to warn you against them.

First, then, let us consider the European method. A young bovine animal, from six weeks to six months old, according to the ideas of the different institutions, is strapped upon its back with its legs distended, on a specially adapted table. The entire abdomen is then shaved and washed, and the operator takes a rather heavy instrument, shaped like a bleeding-lancet at the point and flattened at the sides, with which he makes a series of rows of line cuts, about one inch long and one and a half inches apart, through the cuticle, merely deep enough to draw a slight tinge of bloody serum. On the flat surface of the instrument are the crushed particles of the crust of a matured vesicle from another animal lying on an adjacent table. As the operator cuts with the point of the instrument, he turns the flat side to the cut, and quickly rubs in the bits of vesicle. This is done very rapidly, so that the entire abdomen is inoculated in a very short time. The calf is then released and returned to the stable. On the maturity of the vesicles, which is about the fifth day afterward, the animal is replaced on the table, when we see, instead of the rounding vesicles to which we are accustomed here, a series of very narrow lines of inflammation, with vesicular edges. The belly is carefully washed, and the operator seizes enough of the loose abdominal skin with a special sort of curved lock forceps, to completely include the whole of the vesicular line. The entire vesicle is then scraped off with the edge and carefully preserved on the flat side of the vaccinating instrument. This crushed vesicle is immediately inserted into other animals and into the arms of patients. To preserve the virus for future use, and to send out to physicians at a distance, a number of the vesicles scraped off as I have described are put in one mass in a sterilized agate mortar, and immediately mixed with absolutely pure glycerin and filled into tubular glass bottles. These are carefully corked, dipped into paraffin, and put away in a cool, dark place. They are kept thus for several weeks, and it is claimed that by this process all the extraneous microorganisms present in the lymph are destroyed, while the activity of the virus is in no way deteriorated for a long time. After this period of purification the contents of the bottles are thoroughly triturated with a little sterilized distilled water. This is done by means of a special triturating machine, of elaborate construction, which reduces the mass to a fine homogeneous emulsion. This is filtered and then put up in capillary tubes.

"lymph squares," and vials. These are merely different forms of putting up the lymph, but the substance is the same in all of them. The use of ivory points in Europe has been almost entirely superseded by these tubes and "squares."

I will reserve any criticism of this process, gentlemen, until I have described to you the American method, which is as follows:

I take a young bovine animal, about eight or ten months old, selecting perfectly healthy, clear-skinned animals that are thoroughly weaned and can live entirely on hay and meal. The younger the calf the better, so long as it answers these requirements I place the animal on its side on a special table, and have portions of the escutcheon and belly shaved and carefully washed. I then vaccinate in precisely the same way as in the human subject, by transverse scarifications, drawing a little blood-tinged serum, but making a scarified surface about two-thirds as large as the thumbnail and nearly circular. I use a square portion of the abdomen, anterior to the teats, and place the scarifications in rows of four or five, about two inches apart. My object is to produce a vesicle as nearly as possible to resemble the natural eruption of the disease. I vaccinate directly from another animal.

Up to this point, you observe the differences of procedure from those in Europe are rather of detail than of important essentials. But here comes in the radical difference of the two methods, which lies in the collection and preservation of the lymph. Having scarified the fresh animal, I turn to one on which the vesicles have matured, and selecting a typical vesicle, I carefully remove the crust *in toto* and throw it away Lying under the crust is a thin layer of cheesy pus, perfectly innocuous perhaps, but still pus. This is carefully washed away, leaving a bare, raw surface. Thorough cleanliness is used in all these steps, but no antiseptics are employed, as they would simply destroy the virus. As a rule, I apply no pressure to the denuded surface but leave it severely alone, and at the end of several minutes small drops of a sticky, amber-colored fluid are seen oozing out all over the vesicle. These coalesce and constitute the fluid vaccine lymph, which I use to rub into my scarifications on the fresh animal. To secure lymph for future use and to send away, I have the ivory points dipped carefully by hand, one by one, in this same lymph, dried in rows upon shelves, and then immediately packed in small bundles covered with cotton and silk paper, and hermetically s aled up in gutta-percha tissue. These packages are shut up in air-tight glass jars, away from the light and packed in ice, and always sent out with a caution to keep the vaccine cold, dry, and dark. The best practice is to keep them in a corked vial in a dark refrigerator.

This, gentlemen, in brief, is my method of producing animal vaccine, and an experience of over twenty-five years with it has convinced a large portion of the profession of the country, as well as myself, that it is by far the best, most scientific, and most reliable method. Certainly it is the one best adapted for the climatic conditions of America. The essentials of dryness, darkness, and cold, which are requisite to keep the virus properly, are easily obtained here, where our climate is, in general, dry; and where the use of ice and refrigera'ors is so universal. In many parts of Europe, the damp climate and the extreme rarity of ice, makes a strong argument in favor of the tubes, which are not so easily affected by climatic conditions.

Vaccine virus produced in the manner employed by myself secures typical vaccine vesicles, without any undue severity of symptoms, and affords perfect protection against variola. It is very important to bear in mind the fact that a very sore arm is no proof of proper vaccinal effect.

But it must be remembered that a very large percentage of the vaccine in America is produced by men who, under the guise of some "vaccine company" or "vaccine farm," look entirely to the commercial side of the matter, and, although utterly unheard of in the scientific world, are keenly alive to any method of making more money.

To these persons my method has these very serious objections, viz.: that it takes constant care and skill, that it is expensive, and that the supply of virus from one animal is so limited. In other words, to supply a large number of vaccine points, a large number of calves must be employed.

Now, it has long been known that the greater the age of the animals vaccinated, the more marked and severe are the symptoms produced; and, further, it was found that by increasing the size of the vesicles a very much larger quantity of serum, "virus" by courtesy, could be obtained, although much thinner and more dilute.

From these facts the brilliant theory was evolved that an ideal virus could be obtained by using full grown cattle, three or four years old, and making deep scarifications two inches square or larger. These scarifications in no wise resemble a vesicle, but make a large angry sore, and when ruptured an enormous quantity of thin serum is poured out.

But, argued these *savants*, by this means we can get a large amount of virus from one cow and the dilution of the lymph will be counteracted by the greater vigor obtained from the full grown animals. This idea appealed with great force to the commercial mind, and in accordance with it millions of vaccine points have been produced. The method is labor-saving and cheap, but the theory is utterly wrong, the fact being, it is true, that the larger the animal used the more vigorous the vaccine germ and the more violent the effects on the human subject, but the change from a small vesicle to a large angry sore only increases the flow of inflammatory serum, tending in no way to lessen the vigor of the vaccine germ, but very much diluting the amount of these germs in the so-called virus. In other words, the amount of true virus is not increased, but it is obtained adulterated with a large amount of serum. The practical results frequently obtained from such virus are either very sore and troublesome arms or no vaccinal effect whatever.

Another labor-saving improvement which I must warn you against is the method of fixing the ivory points between two strips of rubber-covered wood, in rows of fifty to one hundred, so that they resemble a picket fence. The operator then ruptures the vesicle, dips a camel's hair brush in it, and paints the pointed ends of the points over rapidly with the brush, leaving an almost invisible coating of vaccine on them. This can be done so rapidly that an ordinary day's work by the proper method is nominally accomplished in fifteen or twenty minutes. Some of the points prepared in this way will take. A great many will fail. There is no possible excuse for this method of charging the points, nor for the method of large scarifications on full-grown animals, except that they are "labor-saving" and "money-making." On all scientific grounds they are unqualifiedly bad and objectionable.

During the past year I have investigated the reasons for the preference in Europe for tubes rather than for points. From conversations with the authorities there and a careful observation of their methods, I am convinced that the modern tube, prepared as I have described above, is much more reliable than the old-fashioned tube of clear virus taken directly from the vesicle.

Our method, however, of charging the ivory points is much more simple, economical and reliable, and we certainly obtain a far purer virus at the start. The vesicle which they grind up and use is not the old-fashioned vaccine crust, with which many of you are familiar. That was the dried covering of the vesicle, which was allowed to remain undisturbed until it dropped off naturally at about the twentieth day. It was then cleaned thoroughly and scraped, and was perfectly dry and almost odorless. The European crust is taken at the height of the disease, when its reticulations and under surface abound with pus cells, and these are all included in the mass that is combined with the glycerin. I am not prepared to deny that this combination renders all the germs present, except the vaccine germ, inert and innocuous. I only say that, if true, it is an extraordinary fact, and that certainly the pure, clear virus that is collected on the points, after all the pus is removed, is a very much purer lymph, as it is taken from the animal.

The real reason, as it seems to me, for the adoption of these tubes in Europe lies in the difficulty of preserving the points in a moist climate and of obtaining ice with which to keep them. We have no such difficulties here, and with us the ivory point will long keep its supremacy as the best form of preserving and using vaccine.

Every one of you has his favorite way of vaccinating. My way is to make two sets of scarifications about two inches apart. I cut with a dull bleeding-lancet about half a dozen short lines close together, just deeply enough through the skin to draw a tinge of serum and blood. These I cross with a similar set of cuts at right angles. I thoroughly dissolve the virus on the point with a little water, then wipe the cuts thoroughly, and immediately rub the virus into the cuts for about ten seconds with the flat side of the point. Then I expose the arm for one minute to the air. No plaster or subsequent dressing is necessary. The arm should be washed at bedtime. In three or four days the vesicle will begin to appear and will be at its height in about eight or nine days, after which it will decline. Unless the crust is broken there will be no severe symptoms with good virus, and indeed there should never be bad and sloughing arms if the patient is in any reasonably healthy condition at the time.

DIPHTHERIA.

It is pleasing to announce that the presence of diphtheria during the biennial period was less frequent than during the preceding period, demonstrating very conclusively that local

boards were more faithful in their duties; for, being a preventable disease, it cannot prevail to any extent, or become epidemic in any community, except by assent of local boards. And herein lies a responsibility which local boards very generally fail to recognize. The record of diphtheria in any community is the record of official faithfulness or unfaithfulness; and every spreading of the disease beyond the original source, and every death therefrom, is a charge, socially and legally, against them. Having the authority and means to prevent it, they are both civilly and criminally liable for their negligence.

The imperfect, unreliable, and unsatisfactory returns made of vital statistics render it impossible to give any comparative mortuary report worthy of credence.

During the period there has been very general complaint against the arbitrariness of the rule respecting heads of families placed under quarantine. As complete isolation of the sick from the well is the essence of quarantine, the Board has modified the rule relating to diphtheria and measles as follows:

When a family is quarantined for diphtheria or measles, the head of the family, or bread-winner, shall have the privilege of attending to his regular business, and of going to and from his house only when complying with the following conditions:

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 2½ per cent solution of carbolic acid, each time after 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, or to any person whose business brings him in intimate contact with children.

There is prevalent throughout the State a feeling of hostility to quarantine, engendered largely by injudicious action of local boards. It is regarded as an arbitrary intervention of human rights, whereas it is simply a misfortune liable to fall upon a family any moment. This antagonism seeks the release of quarantine in the shortest time possible, if indeed it does not evade it altogether.

The State Board has very wisely provided that quarantine shall be maintained not less than seventeen days after the recovery of the last case in a family, and after there has been proper disinfection of the premises and person. The purpose

of this is to cover the incubation period, in case there has been unknown exposure of other persons. It is a provision for safety. And even this is not sufficient. Experience and observation have demonstrated that after the membrane has disappeared the germs persist for many days—even months—and the patient, though to all outward appearance has recovered, can transmit diphtheria to others. An instance in point occurred recently in one of the southern counties of the State, where several members of a family had diphtheria. There were two deaths. On the eighteenth day after the convalescence of the last case, the premises having been previously disinfected, the quarantine was released. The next day a boy of the family was attacked by the disease, followed by the hired girl a week after, and from these two several other persons became infected.

Whether or not the germ of diphtheria has entirely disappeared from the throat of a patient can only be determined to a certainty by bacteriological examination. The safety of the public therefore would be best secured if local boards, especially in cities and towns, and massed communities, would establish a rule that quarantine in cases of diphtheria shall not be released until a bacteriological examination has demonstrated the absence of the infecting germs from the throat of convalescent patients. In many large cities this precaution is now taken with highly beneficial results. The same method may be used in a suspected case of the disease, and the result obtained within twenty-four hours, thus quickly settling a vexing question of diagnosis.

DIPHTHERIA ANTI-TOXIN.

Ever since anti-toxin was announced as a curative agent in diphtheria, there has been increasing interest to know what the outcome would be — not so much from a therapeutic as a sanitary standpoint — or more strictly stated from a restrictive standpoint. If it possesses the curative value claimed — destroying the toxic, and therefore the infectious character of the disease, in two or three days — it is valuable, not for the number of lives saved; but by shortening the duration of the disease the period of communicability from exposure would be correspondingly shortened. It would be interesting to present the results of extended and painstaking experiments and observations as to the reliability and great value of anti-toxin as a curative agent in the treatment of this dreaded disease.

While a great deal has been written against its use it must be conceded that the consensus of opinion, even after eliminating much that smacks of too hasty and superficial experimentation, is that the death-ratio has been lowered by its use and that the duration of the disease has been greatly shortened.

Perhaps the most valuable testimony in favor of its use comes from the celebrated pathologist Virchow who as is well known has been hostile to the germ theory of disease.

At a meeting of the Berlin Medical Society, in December, 1894, Virchow stated that during the months of June and July at the Kaiser and Kaiserin Frederick Hospital five hundred and thirty-three cases were treated — three hundred and three with serum (anti-toxin) and two hundred and thirty without. The former had 13⅓ deaths and the latter 47⅞ deaths!

The Iowa State Board of Health has given no official expression as to the value of this agent, either as a curative or preventive agent.

DIPHTHERIA — QUESTIONS ANSWERED.

During the month of June, 1895, diphtheria, mild in type, and with no fatalities, was prevalent in a town in one of the eastern counties of the State. Some of the physicians regarded it as diphtheria, and others as follicular tonsilitis. Some sputum or portion of membrane was sent to the bacteriologist of the State Board for examination. He reported "true diphtheria" based upon the presence of the Loeffler bacillus, whereupon the child was promptly quarantined, though it was alleged the child had been entirely well for four days prior to the establishment of the quarantine. The establishment of the quarantine, under the circumstances, led to an animated telegraphic and postal correspondence between the Secretary of the State Board and the residents of the town.

Dr. ——— declared he was skeptical in regard to the germ theory of disease, and submitted the following interrogatories:

(1) "Does the State Board accept the theory that the presence of the Klebs-Loeffler bacillus necessarily proves that this bacillus is the cause of genuine diphtheria in man?"

(2) "Does the State Board accept the theory that there are two varieties of the diphtheria bacillus—one pathogenic, the other non-pathogenic: the first found in genuine diphtheria, the latter in various benign throat affections, and in the throats of healthy individuals? Or

(3) "Does the State Board accept the fact of true scientific pathology, which is applicable in actual practice and has stood the test of years, and has been sustained by such authorities as Professor Virchow, Lawson Tait, Professor Park, of New York, Professor Chappel, and Professor Houseman?"

The Secretary has no authority, nor is he disposed, to express the individual opinion of members of the State Board. The following, therefore reflects his own views, which in a measure are in accord with the practical belief of the Board, as expressed in its rules and regulations for the prevention and restriction of diphtheria:

(1) He believes that the presence of the Klebs-Loeffler bacillus necessarily proves that this bacillus is the cause of genuine diphtheria in man. He recognizes the fact that this bacillus has been and may be found in the mouth of healthy persons—persons who fortunately have vigor of constitution and general health sufficient to prevent toxic conditions. He believes that no case of genuine diphtheria can be found in which this bacillus is not present, although it may not be found in all cases.

(2) Yes.

(3) He "accepts the facts of true scientific pathology" so far as they are demonstrated to be *facts*. He believes they are facts "applicable in actual practice." As to their having "stood the test for years," he admits that most of the demonstrated facts of pathology as recognized to-day are modern and that the laboratory is playing havoc with many of the cherished theories of yesterday. As to the names paraded by Dr. —— and their theories, the parties are human and their theories are not Gibraltars. There are others equally eminent and vastly superior in numbers, whose opinions based upon careful observation and impartial investigation, are widely at variance with the views expressed by the parties quoted by Dr. ——. The State Board of Health is laboring for the protection of the public against communicable diseases, and they cannot afford to wait until all these questions are incontestably settled.

The Board has taken the only sensible position it can, and that is to formulate and promulgate rules and regulations respecting small-pox, diphtheria, etc., that express the consensus of opinion of nearly all eminent pathologists and bacteriologists of the world as to the cause, prevention and restriction of the spread of these diseases. Those who are interested in the details of the discussions relative to the germ theory of disease are respectfully referred to the medical press of the country and to standard works upon bacteriology and upon the causes of infectious diseases.

It is not wise for local boards of health to stand around with

their hands in their pockets waiting for physicans with rival pet theories to determine the preponderance of evidence as to whether a sore throat is produced by a Loeffler bacillus or by some other bacillus, or by a coccus. If the attending physician pronounces it diphtheria, or any quarantinable infectious disease, quarantine and isolation must be at once established, and such measures used as will best protect the public. If later it shall be found the disease is not infectious, the quarantine can be released, and no person will be injured thereby.

MEASLES.

There are two very erroneous and harmful opinions prevalent among parents, and also entertained to some extent by local boards of health, that measles are inevitable, and that the best time to have the disease is in childhood. It is a dangerous folly to so hold or teach. There is no necessity for any child to have measles, whooping cough or scarlet fever, and every case of them is evidence of negligence. They are preventable diseases, and the wanton exposure of children to them on the plea that they are children's diseases and they will have them some time is not only dangerous folly but it is criminal folly, as many have learned to their great regret.

It is probably true that over two hundred children die in Iowa annually from measles. Beside those who die many hundreds are physically disabled by having fastened on them diseases of the lungs and air passages and of the eyes and ears.

No good reason can be given for desiring a child to be sick with any disease, and what may be deemed right and safe in one case may be wrong and fatal in another. Because one child is rugged enough to throw off the disease easily is no reason why he should be turned loose and attend school or mingle with other children and be the means of communicating the disease to those less vigorous, and thus inflict pain, expense and possible death. An ounce of prevention is worth a pound of cure. It is a preventable disease. Statistics show a large percentage of deaths from it, and this is abundant reason for the efforts being made to prevent its spread and exterminate it wherever it makes its appearance.

The report of vital statistics of Michigan for the year 1894 shows that from 1890 to 1894 there were twenty-two thousand and four cases of measles reported. There were two hundred and fifty-eight deaths. There was no quarantine nor isolation. There were also one hundred and ten cases in which quarantine and isolation were maintained, and there were no deaths. For the year 1894 forty-five per cent of deaths from measles were of children under six years old; sixty-five per cent under eleven; thirty per cent, ten to thirty, and over thirty, none. Of the cases reported over seventy-five per cent were of children under the age of eleven.

Early in the history of the State Board of Health measles was put in the list of quarantinable diseases, subject to all regulations applicable to other infectious and contagious diseases.

Scarlet fever is also one of the dreaded diseases of childhood, and a few years ago prevailed extensively over the State, because of the opposition to quarantine measures. By a sensible dread of that disease and a moderate compliance with quarantine regulations, it is rapidly disappearing. There is good reason to affirm that if quarantine and disinfection were promptly and faithfully observed, both scarlet fever and measles would be as rare as small-pox.

In England it is exceedingly rare to see or hear of a case of scarlet fever. The same method applied vigorously in cases of diphtheria, measles, whooping cough and mumps, would in time stamp out the diseases entirely.

Would not such a course be infinitely preferable to the policy of inviting these diseases and encouraging and assisting them in their demands for fresh subjects by sacrificing our beloved children to their seductive and fatal greed?

Pertinent to this article, and instructive also, is the report of Dr. R. Thorne Thorne to the Secretary of the Local Government Board of London for the year 1895. He says:

> The question of measles as a cause of death in this country has engaged the attention of the medical department for several years. The death rates from most of the diseases of the zymotic class have continually decreased decade by decade, whereas measles has increased, and during the quinquennium, 1890-'94, the deaths from this disease now stand a figure higher than that for any other disease of the zymotic class except whooping cough and diarrhœa. The sum total of the deaths registered as due to measles in England and Wales during the ten years, 1885-'94, reached no less than one hundred and twenty-nine thousand four hundred and twenty-six, or a yearly mean of twelve thousand nine hundred and fifty. Now, measles is a disease the mortality from which falls almost exclusively on children; especially is it fatal to infants in the second year of life. This is more noteworthy since, relatively to their number, children aged two to five years would appear much more prone to measles' attack than other persons, or than infants under two years. The mortality from measles is much greater in towns than in country places, where opportunities for intercommunication between the healthy and the sick are more abundant than in rural areas.
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> In view of these and other considerations it appeared desirable to take account of those measures that are likely to avail urban or rural authorities in the prevention of measles, measures designed to meet epidemic prevalence of the disease, or directed toward such control over it on its appearance as to arrest or delay a threatened epidemic. The importance of control of the latter sort is apparent on consideration of the age at which measles is most fatal. If in any district, measles, which formerly was epidemic every other year, be so far discouraged by preventive measures as to acquire epidemicity only every fourth year, it is clear that a large number of susceptible children will, when the epidemic arrives, have reached ages at which the disease is little fatal, and in this way many lives will be saved which were formerly sacrificed to this disease.
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> Prominent among the difficulties in the way of preventive measures are, on the one hand, the extremely infective character of measles—especially in the early stages, before the nature of the disease is declared—and on the other, the slight estimation in which measles is held by the general public. The first step must be to obtain accurate knowledge of the persons attacked, many of whom never come under medical treatment. Every case reported or heard of must be made the subject of a personal visit. Repeated and detailed inquiries should be made by the sanitary officers in invaded households, if the spread of the disease from such houses is to be adequately controlled.
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> So, too, regarding schools. If preventive measures are to be of avail, they must be contrived to secure the exclusion from school of all children from any house which is invaded by measles, and if necessary of children living in the neighborhood of invaded houses, and even to all schools, Sunday and private, in the invaded neighborhood, and to other gatherings of children, before real advantage can be expected from the proceeding.

WHOOPING COUGH.

It is evident that very few people have any just conception of the magnitude of the fatality from whooping cough. To those who study vital statistics it is a disease demanding earnest consideration. By the masses it is considered a disease incident to children, of little importance, and not subject to sanitary regulation. Every mother becomes terrorized upon the appearance of scarlet fever in the vicinity of her home. Yet it is a fact that more children die from whooping cough

than scarlet fever, and nearly all the deaths are of those under five years, the majority being under one year. The census report states that for the year ending May 31, 1890, eight thousand and thirty-two children died in the United States from whooping cough; while there were only five thousand nine hundred and sixty-nine from scarlet fever.

The following statement is made from the official report of the States, for the years named:

	WHOOPING COUGH.	SCARLET FEVER.
Rhode Island, 1895	129	123
Massachusetts, 1895	435	312
Michigan, 1895	140	116
New Jersey, 1896	275	183
Connecticut, 1896	127	65
District of Columbia, 1896	22	7
	1,128	806

The following table shows the deaths for the year 1895, in the cities named:

	WHOOPING COUGH	SCARLET FEVER.
Baltimore	68	59
Brooklyn	263	124
Chicago	122	77
Cincinnati	38	6
New Orleans	22	5
New York	496	468
Philadelphia	251	79
St. Louis	23	20
Des Moines	5	2
	1,288	860

These figures probably do not show more than two-thirds the actual number of deaths, but they are sufficient to indicate not only the wisdom, but the necessity for the intervention of sanitary measures to prevent the spread of whooping cough. Its ravages are greatest among the babies. It is an infectious disease, and is communicated by contact with an infected person or something which has been about an infected person. Isolation of the sick, is the only means of preventing its spread, and this often comes too late, as it is communicable before the "whoop" appears. There is a very general indifference among parents respecting this disease, as has been stated, hence, it is difficult to secure the proper and necessary isolation, during the protracted period through which it runs. Parents exercise little or no caution to prevent exposure. It is not uncommon

to hear the familiar "whoop" on the street, in railway cars, and public places.

Mothers should be especially vigilant to guard their nursing babes from exposure, for it is upon those under one year of age the fatality falls most severely. Should the disease appear in a family of children, in which there is a babe, the babe should be removed from the home—at least it should be kept entirely free from all possible contact with the sick.

On the appearance of the disease in a community it is the duty of the mayor of a city or township clerk to take cognizance of it and see that measures are provided to prevent its spread. There is no necessity of shutting up adult members of the family. Children of the family should be excluded from the schools and public gatherings, and all children should be rigidly prohibited from entering the premises, which should be placarded with the danger card. Although the State Board of Health has made no official order for placarding whooping cough yet local boards should see that it is done.

HOW DISEASES ARE SPREAD.

November 30, 1895, the recorder of Rock Rapids, reporting a case of scarlet fever, said the source of contagion was supposed to be a letter received from friends in Illinois whose children at the time the letter was written were sick with scarlet fever.

Having often heard and read of contagious diseases being communicated by letter and by articles of wearing apparel, request was made for further investigation, and the following reply was received:

Pursuant to request I have investigated the matter and find this letter was received last December (1894), and after being read was laid away. Three days before the child was taken sick the mother was looking over some old letters and the children were around her. When this letter was reached the little girl exclaimed, "There is auntie's letter," and proceeded to open it out and held it some little time. The letter was written by the mother's sister, whom she intended to visit during the holidays, and told them not to come as their children were then all sick with scarlet fever.

There had been no previous cases of scarlet fever in Rock Rapids, and this child had, so far as known, had no other possible opportunity to be exposed.

We think the fact reasonably well established that this child contracted the disease from the letter in question—especially when considered in connection with so many similar cases.

The Medical Inspector for Somerset county, Pa., reported to the State Board of Health as follows:

Two years ago a child died from scarlet fever near Downey. The cradle in which the child died was afterward sold at auction, the purchaser having full knowledge of the death of the child. They washed the cradle thoroughly six times with boiling water, and did not believe that with such cleansing and the lapse of two years there was any danger. A babe eight months old was placed in the cradle to sleep. In ten days after scarlet fever appeared in mild form, which passed to recovery, but was followed by that of a boy two years old, then the mother, next an aunt who had assisted in nursing the children; then the grandmother, sixty years old; and last the father, with all of whom the form was very severe. There were no other cases in the neighborhood.

The Health Officer of Osage, Dr. J. H. Hoffman, writes:

"I was called a short time ago to a family of seven children, all sick with malignant scarlet fever, none of whom had been exposed to the disease, so far as could be ascertained. A short time prior, the family had purchased a dog of a family some distance away, and in that family there had been several cases of scarlet fever. I have no doubt the disease was brought from that family by the dog.

In another locality I was called to a family in which a boy had died, and four other children were sick with malignant diphtheria. The disease was not in the vicinity, and there had been no exposure in the ordinary way. The house and surroundings were in good sanitary condition. Investigation disclosed the fact that a week prior five cats died on the premises with all the symptoms of diphtheria. We usually call such outbreaks "sporaidic," but I have no doubt the disease germs are brought by animals.

For several years diphtheria periodically appeared in a certain locality in Hamilton county. Its nidus seemed to be near an old church building which was also used for school purposes. From this point the disease spread throughout the surrounding country. It was found that a large number of rabbits had been for five years hibernating under the church, and the resident physicians became convinced that the rabbits had planted the germs of the disease.

Dr. Charles E. Young, of White Plains, N. Y., writes that he was called to see a well-developed case of diphtheria, the patient being a woman twenty-four years old. Upon investigation she could recall no exposure to the disease, unless it came from a lock of hair. She then related how a child had died a year prior, from diphtheria. A lock of hair was clipped from its head, wrapped in paper and placed in a box. In rearranging the drawer she found the box, took out the lock of hair, contemplated it for some time, and then replaced it. The next

day the first symptoms of the disease appeared. The lock of hair was consigned to the fire.

A physician in a country village was called to a child sick with scarlet fever, which resulted fatally. The source of infection was traced satisfactorily to a letter written by a mother one hundred miles distant, in whose family several were sick with the disease. On receipt of this letter the envelope was given to the patient of this doctor to play with.

Sanné reports a case where two persons received a note from a friend convalescing from scarlet fever, who wrote she was desquamating so freely she had to brush the dust from the paper on which she was writing. Several days later both recipients became ill with the disease.

It is now universally admitted that calves, horses, cats, fowls and rabbits are liable to a disease nearly identical with scarlet fever and diphtheria. Numerous instances are recorded where these diseases in animals preceded, accompanied or followed an epidemic among human beings.

Dr. Jacobi, of New York, mentions a case: Five children were ill with diphtheria in one house; three kittens that played with them died, and post mortem examinations showed diphtheritic membranes in their throats. Dr. Bruce Low mentions an interesting case: A cat living in the house with a boy that had diphtheria took the disease, communicated it to the cat of another person, and four little girls that nursed the second cat became ill with diphtheria.

Gerhardt has published a case that seems to show that diphtheria of hens may be communicated to dogs and men, notwithstanding the opinions of Loeffler, Pfeiffer and Klein to the contrary. A large number of hens were brought from Verona to a village in Baden; some were suffering with the disease when they arrived, and about half of them died. All the chickens bred in incubators died; four cats kept in the place died of diphtheria, and four of the six men on this poultry farm had diphtheria. In 1885 Dr. C. J. Renshaw described some cases in which cats that had swallowed portions of diphtheritic membrane from human sufferers died of a disease resembling diphtheria.

It is probably true that epidemics of scarlet fever and diphtheria, the sources of which are mysterious, can be traced to cats and dogs. Household pets are well-known marauders. Nocturnal excursions are frequent, and at long distances. Cats

especially, because of their domestic habits, have a penchant for visiting neighboring houses, and especially when encouraged, to amuse a sick child.

The transmission of diphtheria to human beings from fowls is affirmed by Gerhardt, Debrie, Menard, Schrevens, and other writers. Cole reports a case in Jacksonville, Ill., where a sick chicken was taken into the house and fondled by a child two and one-half years old. Four days later the child was taken with diphtheria and died. There were no other cases of the disease in the neighborhood, and the affected chicken was the only source of infection.

It is evident from the limited investigations made that diphtheria prevails among fowls to a larger extent than is supposed. Their habits of living, running at random over wide ranges, picking food from garbage and manure piles, render them especially liable to infection. It is a common practice to bring sick chickens into the house for treatment, where children are permitted to handle them, and it is evident this disease is spread in this manner more extensively than has been supposed, and that many cases of mysterious sources of infection of children could be traced to infected poultry.

Dr. Charles McKinnis, of Ollie, reported several cases of scarlet fever in Jackson township, Keokuk county, that illustrate quite clearly the sources of infection. The disease occurred in three families. A sister of one of the families was residing in North English with a family in which scarlet fever was present. She visited two families in the locality above given. In eight days a child in one of the families visited took the disease; in eight days later a second child was taken down; in eight days a third, and on the seventeenth day a fourth one. These four cases were in one family. The doctor does not report the entire number of cases, but while two cases were severe none had died.

In one of these families the source of infection was not definitely determined, but may be readily accounted for since the father is a stock shipper, rides all over the country, and doubtless carried the contagion into his home in that way.

As far back as 1886, Hoffman demonstrated the presence of tubercle bacilli in the bodies of flies captured in a room occupied by a consumptive. The droppings of the flies were full of the bacilli, which were shown by experiment to be fully virulent.

Six years later, Dr. A. Coppen-Jones, of Switzerland, by employing cultures of chromogenic bacteria, proved that infection can be, and actually is, carried, not only in the bodies of flies, but also by their feet. They come from the barn yard and from the reeking corruption of the carcass; they come from the swill pail and from sewage, they come from everywhere and everything that is suggestive of filth and infection. Their feet and legs are covered with morbific matter and they come into the kitchen and crawl over the bread, and sugar, and fruit, and cake, and pie—over everything not securely covered, depositing not only the filth of their feet and legs, but evacuate the contents of their body, which in all examinations have been found laden with bacteria—often of the most poisonous kind! Decency and a due respect for health suggest that money spent for screens for doors and windows, and for sticky fly paper is money well spent.

A source of danger among school children is the slate and pencil. It is a common practice in schools to give the slate and pencil to pupils, without any regard to individuality—that the same child have the same slate and pencil each day. The pencils go from mouth to mouth, while the slates are cleaned with saliva by the fingers, thus conveying to the mouth any bacteria that may be on the slate. Thus, if a child have a diphtheritic sore throat, the disease germ might be conveyed to the mouth of a healthy child.

Library books are also a source of danger. They should never be handled by persons sick with contagious diseases, especially scarlet fever. So impalpable is the dust of desquamation, and the vitality of the disease germ so great that the handling of exposed books after a lapse of years would be dangerous.

Drinking cups in schools are unquestionably a source of infection, especially from diphtheria. Teachers should impress upon pupils that drinking cups should be cleansed and made sterile by the use of boiling water, and the habit which now prevails in schools, railroad cars, stations and public parks of promiscuous drinking from cups never made sterile is a reckless exposure to the contraction of diphtheria and other contagious diseases.

A school water-bucket might easily become infected by immersing a dipper therein direct from the lips of a child just coming down with diphtheria, or who has returned to school

during convalescence and before the disease germs were absent from the throat, which may be several days. The frequent changes of water in the bucket would, however, make this danger less than from the use of the cup by a child having an inflamed throat, and drinking from the cup directly after a sick child had used it.

Safety requires that no chances be taken. No child who has had diphtheria should be permitted to attend school until it has been satisfactorily demonstrated that the germs of the disease have entirely disappeared from the throat, not only of the convalescent but of all other children in the family who are attending school. Further, no two children should be permitted to drink from the same cup; each should have his individual cup.

The danger of contracting disease from money is illustrated in the case of Alexander Waltzfelder, bookmaker's cashier at Harlem race track, near New York. He had contracted the habit of carrying bank bills in his mouth, and one day accidentally bit his lip. The wound at once began to swell. He was treated by Dr. Irving, of New York. The wound healed, and a cure seemed to have been secured. Soon after he received a bruise on one leg—a slight abrasion of the skin—while getting on a car. The leg soon began to swell, and he became so ill he was taken to the Presbyterian Hospital, where the physicians diagnosed blood poisoning, the primary cause being the old bank note trouble. Every possible effort was made to save his life, but the disease germs permeated his whole system, and he died.

It is too much to expect that the hygienic principles involved in these suggestions will be thoroughly adopted by the present generation, yet it is possible that the children can be so in doctrinated with the facts of bacteriology that ere long there will be such general use of preventive measures as will very materially aid in the protection of life and health.

RESPONSIBILITY OF PHYSICIANS IN CONTAGIOUS DISEASES.

An extensive acquaintance with the physicians in Iowa warrants a belief in their exalted character, intelligence and conscientious regard for their relationship to the public health, as a whole, but there is forced the conclusion that there are those who, in cases of contagious disease, so far ignore this relation and responsibility as to render them amenable to the criminal law.

With much regret the statement is compulsory that there are physicians who seek to secrete the true nature of contagious diseases which come under their supervision, and to mask them under some other name, for the purpose of protecting their patrons from quarantine; and also through fear that others would be afraid to call them professionally if it were known that they were in attendance upon infectious cases.

At the meeting of the American Public Health Association a delegate related the following incident:

In a certain town, which shall be nameless, there lived two families opposite one another on the same street. There are children in each, the mothers are intimate and dear friends, and a day does not pass that the families are not more or less together. Recently a child in one was taken sick. The attending physician diagnosed the case as scarlet fever, but, as it was a very mild case, said he did not think it worth while to make an alarm by mentioning it. The children of the family opposite, several in number, visited the little sick friend daily, no one dreaming of danger. They all took scarlet fever and one died. The first time the stricken mother met the physician of the first case she upbraided him with, "Doctor, you killed my child." He attempted to excuse himself, but to the mother heart mourning in bitter agony over the needless sacrifice of her child that might have been so easily prevented, there could be no excuse. "Doctor," she repeated, "you killed my child. If you had told my friend that her child had scarlet fever, she would never have permitted my children to enter her house."

So sadly true to life, and so universally applicable were the comments of the delegate from the North Carolina State Board, who heard the recital, they are reproduced here, that every reader, and especially physicians and nurses may profit thereby:

What an awful accusation! How those words must ring in his ears, and what a pang, if he is not devoid of feeling, the sight or mention of that mother must always bring to his heart!

Now in this case the motive of the physician was doubtless in a certain sense a praiseworthy one—the indisposition to say or do anything disagreeable—but that fact cannot erase the dreadful consequence of his failure to do his plain duty. That the attack was a "mild" one, which was urged as an excuse, was, of course, no excuse at all, for any physician who has learned the a b c of medicine knows that the disease can be contracted from a mild as well as from a severe form, and no man can predict what course the secondary case will pursue.

But the duty of the attending physican to sound a note of warning is not restricted to cases in which the diagnosis is plain. Whenever there is

any doubt about the diagnosis, as, for instance, in a supposed case of roseola where scarlet fever is known to exist in the community, it is clearly his duty to insist upon the observance of every precaution at least until sufficient time has elapsed for desquamation or its absence to settle the matter. He has no right to take any chances when such serious consequences are involved — to stake the comfort and convenience of his patron against the possible loss of innocent lives. And when the diagnosis is practically certain it does seem to us that a failure to promptly take steps — every available means — to prevent the spread of the disease would amount to criminal negligence. It may be considered a rather strong expression, but we hold ourself ready to defend the assertion that any physician who knows that he has a case of contagious disease of a kind liable to produce death and who neglects to have carried out to the very best of his ability every sanitary precaution to prevent its spread *gambles in human life*. How any man can assume the terrible responsibility of a failure to do this simply passes comprehension.

Not only is there a moral and social responsibility, but the physician who for any reason, having recognized the presence of a quarantinable infectious disease in a family, neglects or refuses to give notice to the proper authority, is liable for criminal negligence, and if by reason of such negligence there are other exposures and sickness and death ensues he is guilty of manslaughter.

Quite the contrary, and highly commendable, is the instance of a woman into whose house scarlet fever had entered and who determined that not a suggestion or direction of the health officer should fail of her cordial and energetic support and execution. Promptness, energy and persistence characterized every effort she made to prevent the disease from reaching other people. As a consequence, her three other children escaped the infection and, after a period of maternal anxiety, such as none but the maternal heart can know, her sick one recovered. Subsequently the health officer said to her something like this: "Madam, your child caught the disease through somebody's carelessness or mismanagement, but no other mother's child caught it through yours. So far as you had to do with the progress of this epidemic, it never got past your house; and if everybody would do as you have done, the disease would be quickly stamped out. No failure on your part has filled any other woman's home with mourning."

"Well," said the relieved mother, "what a comfort it is to know that."

In May, 1896, the clerk of a township reported a serious outbreak of diphtheria in his and an adjoining township. An

investigation traced the source of infection to a young woman who had come to her home in the township from a town in an adjoining county where she had been employed, and been sick with diphtheria. Before starting she asked her physician "if it was safe to go where there was a family of children?" The physician said to her she could go where she pleased. She had been quarantined sixteen days.

The third day after arriving at her home she visited a family of relatives in another township. Soon after, two children in that family were attacked with diphtheria. On the fourth day children in her own family were taken with the disease. From these cases the disease spread until seven children were carried to the tomb. Some one did a great wrong. When this girl went home it was shown she had a cough and expectorated considerably. The germs of the disease were doubtless in her mouth and throat, showing what has been demonstrated so often, that an early release from quarantine is always fraught with danger. It would seem in this case that the attending physician assumed a fearful responsibility and did an irreparable wrong.

This incident notably evidences the importance of physicians so informing themselves in regard to the nature and danger of infectious diseases, and so conspicuously conforming to the best methods known for the restriction of their spread that the laity, following the advice and practice of these sanitary as well as medical advisers, may be enabled to escape these preventable afflictions.

The legal responsibility should not be forgotten. Can it be questioned or denied that a physician who carries germs of disease into a household and death ensues therefrom is guilty of murder?

This fact alone should be impressed upon every physician who, in the light of the knowledge of the present day, neglects to become thoroughly informed of the teachings of sanitary science and act accordingly.

In the course of a discussion on antiseptic midwifery, before a New York medical society, Dr. Thomas Darlington said that "whenever there was sepsis it came from the physician, not from the patient." Divested of all verbal adornment, it is equivalent to saying that every woman who dies of puerperal sepsis has been in reality murdered by the man to whom she has entrusted her life.

CAUSE AND PREVENTON OF CANCER.

Inasmuch as cancer is one of the most dreaded and fatal diseases to which our country is liable no excuse is needed for, at this time, calling attention to some facts pretty generally admitted respecting its cause and prevention. As to the *cause*, pathologists pretty generally are in accord with the theory expressed by Dr. C. Pittfield Mitchell, *member of the Royal, College of Surgeons*, England, in his able treatise, "The Philosophy of Tumor-Disease."

He claims that the difference between malignant and non-malignant growths—between cancers and benign growths, "is is not one of specific nature and causation, but simply one of development and structure." As cancer is essentially a disease of mature, if not advanced, age, Dr. Mitchell regards it as intimately associated with tissue dissolution. He says: "It is because the germs of a tumor are begotten by tissues whose vital powers are nearly exhausted that the germs acquire ascendancy;" that "the process by which tumors are generated is a process conditional upon the decline of tissue-vitality," and that "we must draw the corollary that a tumor is a local disease; local by the derivation of its elements, and local by the conditions of the derivation. Whatever the systemic or constitutional effect of tumor disease, these are secondary, and not primary events." Notwithstanding the fact, however, he says that constitutional or systemic conditions exert an influence upon both the origin and growth of tumors.

One of the most comforting conclusions that Dr. Mitchell arrives at is, that "tumors are not transmitted by descent." He arrives at this conclusion not only as consistent with the proposition above referred to, but as the consensus of opinion as expressed by eminent writers upon this disease. Sir James Paget is most inclined to the theory of transmission by inheritance. Of three hundred and twenty-two cases he thinks twenty-five per cent were attributable to inheritance; Bryant, in six hundred cases, twelve per cent; Gross gives 9⅞ per cent as the result of his observations; Gussend, 7⅛ per cent; Sibley and Barker, 8⅛; Jessett, 2⅝ per cent; Snow, in ten hundred and seventy-five cases, 15⅞ per cent.

Allingham, Winiwarter, Holmes, Morris, and Butlin, all are inclined to doubt that heredity has any recognizable influence in producing the disease.

Assuming that our readers, without further argument or quotation, are disposed to regard cancer as a local and acquired disease, rather than constitutional and hereditary, we proceed to consider a very common cause for the appearance of the disease on the lips and tongue—in the mouth and throat; our design being to point out not only a very common, but easily preventable, cause.

Dr. Mitchell, our author, in speaking of cancer of the lip, says: "A very large majority of men suffering from epithelial cancer of the lips are great smokers. In Winiwarter's cases nearly all the patients were smokers; there were only about three who did not confess to this habit. From the Middlesex Hospital Reports we learn that of twenty-four cases in which inquiries were made as to *smoking*, etc., fifteen had been great smokers, and eight, moderate smokers; five of the smokers had chewed as well; one had never smoked."

Of one hundred and sixty cases of cancer of the lip, collected by Mr. Jessett, one hundred and forty were affected in the *lower* lip, five in the upper, and fifteen in both lips. Dr. Mitchell says: "It is an accepted and almost trite fact that the principal cause of lip cancer is the irritation arising from the use of pipes." * * * "The pipe of the smoker rests upon the lower lip, and it is partly owing to the great irritation of the lower lip thus entailed that this structure is the common seat of the disease." He further says that the disease invariably occurred on the side of the lip in which the pipe or cigar was held. He quotes Mr. Jonathan Hutchinson as saying: "There was not a single instance of symmetrical development of the disease on *both* sides of the mouth," in a series of more than one hundred cases, observed by him. Dr. Mitchell adds: "And still more remarkable, in three cases of this series reported by Hutchinson, the disease recurred, after excision, on the opposite side, the original scar undergoing no changes; *but in these three cases the patients held their pipes on the sound side after the operation.*"

He says further: "Of sixty-three cases, only one was in a woman, and of one hundred and sixty cases, only three were

in women. Now women, as a class, are addicted neither to smoking nor chewing tobacco, nor are they as intemperate as men." In six cases of cancer of the lip in women, three were in the habit of smoking, and it was not shown that the other three were not. Mr. Pemberton in his "*Clinical Illustrations of Various Forms of Cancer*," says: "It is remarkable that in the only instance in which I have seen the disease amongst women, the short pipe was the constant companion for seventeen years."

Another location of cancer and its relation to smoking should be considered, viz: Cancer of the tongue, more terrible because less curable than that of the lip. The latter is often cured by excision, the former is seldom operated on until too late.

After stating that in seventy-five cases of cancer of the tongue, it was ascertained that only four patients did not smoke, Dr. Mitchell goes on to say: "It is, I think, a quite warrantable conclusion that smoking is a common cause of cancer of the tongue, and the fact may be at once connected with the circumstances to be explained, namely, that the sides and edges of the organ are the most frequent seats of the disease. The pipe or cigar of the smoker is, with rare exceptions, so held in the mouth that the impact of its point falls not upon the tip, dorsum, root or under surface, but upon the sides and edges." * * * "In the most typical instances it appears about the middle of the front part of the dorsum, but on one side of the middle line, just where the end of the tobacco pipe rests, or where the stream of smoke from the pipe or cigar impinges on the surface of the tongue."

He quotes Mr. Butlin, author of "*Diseases of the Tongue*," as saying, cancer of the tongue is "incomparably more frequent in males than in females." Jessett says: "In one hundred and ninety cases of cancer of the tongue, one hundred and sixty-three were in men and twenty-seven in women," and Winiwarter states that in forty-six cases forty-three were in men and three in women.

Mitchell, in conclusion, says: "The different habits of the two sexes is the meaning, we may be sure, of the relative frequency of the disease in males and females."

It is not claimed that smoking is the only cause of cancer of the lips and tongue, but by all odds the most frequent cause, much more frequent than all other causes combined.

There are no physicians or laymen of any extended observation but have seen cases of cancer of the lips, tongue

or throat; and we venture the assertion that very few, if any, have ever been seen that were not caused by the use of a tobacco pipe, or some agent that has kept up, for a period more or less prolonged, pressure upon, or irritation of the parts affected.

It is not the tobacco so much as the irritation and impaired vitality—"tissue dissolution"—that are produced by the pressure from the cigar or pipe, or by the hot smoke in the mouth and throat that produces the affection. Broken or carious teeth, or the constant pressure from a quid of tobacco, and the irritating effects of strong drinks, also cause the disease.

It may be said, and can be demonstrated, that the same conditions of tissue dissolution produce mammary and genital cancers as well as gastric and uterine tumors.

PREVENTION.

The conclusion is reasonable—that cancer is a disease of "development and structure," intimately associated with "tissue dissolution." If so it is a disease resulting in most cases from clearly discernible and avoidable causes, and hence is largely a preventable disease, and not hereditary as so universally feared.

The design of this article is to point out some of the means of prevention. There is perhaps no disease more dreaded than cancer. It is not only painful and loathsome in many of its forms, but so fatal that when a person is declared, upon competent authority, to have cancer, especially of the internal organs, hope takes her flight, and raven-winged despair takes her place in the bosom of the unfortunate subject.

The frequency with which tobacco smokers are affected, when compared with non-smokers, especially with cancer of the lips and tongue, has already been shown. There are some conditions, such as old age, which greatly predispose to cancer, and which it would not be desirable to prevent. But even old age may greatly reduce its risks from this disease.

Dr. Mitchell, in his able work, "The Philosophy of Tumor Disease," says: "That tumors are not of spontaneous origin, but acquired, is established by two bodies of evidence, the facts as to causation, and the argument from heredity." * * * We have seen that there are no grounds for believing that tumors are or can be inherited. Thus we are prepared to surmise, in opposition to current opinion, that tumor disease may not be wholly unpreventable.

Because any disease may not be *wholly* prevented, is no good reason why it should not be prevented as much as possible.

He says further: "Diseases are prevented by avoiding and removing causes. The most effective of the causes of tumors in general are avoidable and removable."

Speaking of age as a predisposing cause he says: "We are led to think that age alone will sometimes be efficient. It rarely happens, however, that some special cause is not superadded. * * * Age is decided not only by the years, but also by the life that has been lived. The cancerous tongue of a man of thirty-five is older than the healthy tongue of a man of eighty. In thinking of age as a cause of tumor disease, we must have in mind the number of years in relation to the life experiences of the organism, and therefore in order to diminish the favorableness of advancing years, both the local and the general life of the tissues should be carried on without undue waste of those powers through which the individualities of the whole and its units are maintained. *Hence it appears that while age as a predisposing cause of tumor disease is irremovable it is yet possible to increase or weaken its force.*"

Taking up the consideration of tumors in special localities, and the means of their prevention he says: "Nowhere else in the body is the prepotent influence of local irritation over all other conditions as clearly and conclusively shown as in cancer of the lips. Without the use of the pipe, and without other local circumstances, competent to exhaust the local contained life, energy of the tissues, the general and predisposing conditions, we may conclude, be entirely nugatory."

In regard to cancer of the tongue, he says: "Abstinence from, or the strictly moderate use of tobacco and alcohol, and the avoidance of every other source of lingual irritation, would, with the greatest probability, prove completely preventive."

In speaking of cancer affecting other portions of the alimentary canal he says: "We have seen how intemperance is probably the chief inciting condition of cancer of the pharynx, œsophagus and stomach. It seems impossible to doubt the preventability of these diseases, and that future research into their causation will show them to be rigorously dependent on violation, often gross and persistent, of rational dietetics."

In regard to cancer of the breast, so common in women, he attributes it largely to physiological bankruptcy caused by prolonged excessive nursing, and other sources of local irritation. He says: "With the evidence before us of the part

which destructive inflammation of the breast plays in the genesis of cancer, prevention of such inflammation assumes great importance. And here, it will be remembered how very often the perversions of mammary function, associated with depressed nipples, are succeeded by cancer; and how depressed nipples may in turn be traced to the pressure effects of the corset."

But space prevents the further pursuit of this subject in detail.

It is well to repeat that Dr. Mitchell's theory of the cause of tumor disease is that of "histogenic dissolution," a perversion, a pathological tissue-change induced measurably by local irritation. The pipe or cigar produces cancer of the lips or tongue, not so much because of any chemical or therapeutic action of the drug, but because of the pressure of the pipe and the cigar upon the lips or against the tongue, and the irritation of the smoke in the mouth leading to "histogenic dissolution." Dr. Mitchell's philosophy of tumor disease is not only the most rational, but the most hopeful that has been presented. If by any measure fifty or seventy-five per cent of these cases can be prevented, it is well worth the trial. These facts should lead to a thoughtful and faithful avoidance of those practices that mostly lead to such disastrous results.

GLANDERS IN A CHILD.

In June, 1897, the following case of glanders in a child was reported by Dr. F. J. Smith, at Alton, in Sioux county.

ALTON, Iowa, June 18, 1897.

Dr. J. F. Kennedy, Des Moines, Iowa:

DEAR SIR—I have a case in a child that seems to me to be chronic farcy. The child is three years old. So far as known the child has not been exposed, but there have been a number of cases of glanders in horses in that neighborhood. The child has been sick now about three months; is cachectic in the extreme, though it appears to look a little better than formerly, and gaining strength somewhat.

There have been sores and boils forming all over the little one's body, but most of them on the fingers and toes. There would first be some erythema, then inflammatory swelling, which increased till finally the mass would break down and a deep slough would result exposing tendons, bones, etc. The smell of the pus was very offensive, a mawkish, sweetish

sort of a smell, something like gangrene, yet not the same. One toe dropped off altogether, the others were all sore and ulcerated, and at their bases the ulcers extended almost to the bones. These sores are all healing now, but there is a tendency for them to return and break out anew.

The buccal mucous membrane, tongue and lips were literally one large ulcer, with a foul smelling discharge. There was a bronchitis, laryngitis and nasal and post-nasal catarrh. The laryngitis was so bad that for a while she could not articulate, but that is better now. The bronchitis was for a little while about gone, though now there is a return of the same.

There have been swellings about the face, back and abdomen, some resulting in abscesses, others gradually disappearing without the formation of pus.

Have you not the authority to order up some one who has seen chronic glanders in a human being, and who could positively affirm or refute my diagnosis? If you have no authority to do so, or no funds at your disposal for that purpose please let me know, and then also let me know what to do, as the case may be a menace to the public health, and ought to be quarantined if it is chronic farcy. The people are very poor, so they can not do anything.

Yours respectfully,

FRED J. SMITH, M. D.

ALTON, Iowa, June 25, 1897.

Dr. J. F. Kennedy, Des Moines, Iowa:

DEAR SIR—The child I wrote you about has died. The bronchitis that was slightly worse again when I wrote you, kept increasing until Wednesday, when the little one died. Dr. J. I. Gibson, State Veterinary Surgeon, came, but too late. He agreed with me as to the nature of the disease.

Your suggestion as to scrofula and syphilis had occurred to me before, but a fair trial of anti-syphilitic remedies did no good, nor did any remedies directed to the scrofulous condition seem to help. I have not the slightest doubt any more as to the nature of the disease.

The glanders poison in this case was evidently introduced into the system through the stomach or intestines and an attack of "lung fever" followed by an attack of the "grippe" was probably really the breaking out of the disease, for it was right after that that the local lesions made their appearance, and which were at first confined to the fingers and toes, soon appeared on the back, neck, arms and legs. The whole mouth was raw and some of the teeth fell out, the gums having a gangrenous appearance in places, the face was swollen, especially on the right side, the larynx and bronchia were implicated and so were the nares. I was speaking with a veterinarian who had seen glanders in the human being in Europe in cavalry men, and he described cases to me. From his description I judge that my case was just like some of the cases he saw. At any rate I have not the slightest doubt as to the case being one of glanders.

Fraternally yours,

FRED J. SMITH, M. D.

FOOD POISONING.

IN DES MOINES.

In August, 1896, three or four families, containing nearly twenty persons, in the city of Des Moines, purchased some prepared beef of a local butcher. In a short time, varying from a few minutes to two or three hours, all the parties eating of the meat became very sick—having great nausea, excessive vomiting, frequent passages from the bowels, and very great prostration. Two or three were regarded for some time as in a very critical condition, some soon recovered, and all finally got well.

A careful personal investigation was made of the method of preparation of the meat and of its effects upon those using it. The following facts were elicited: The meat consisted of scraps of beef that had been in "pickle" or brine for from a week to ten days. It was taken out of the brine in the afternoon of July 17th and boiled until it was tender enough to be picked apart. After being picked apart and all bones removed in the evening (Friday) it was put into an iron cylinder press with an iron cover. There was a thin cloth lining the cylinder and underneath the cover to prevent contact with the iron.

It was subjected to hard pressure all of Friday night, and Saturday forenoon was put on the counter as a body and sliced off as sold. Quite a number of persons bought of it at various times on Saturday; some was sold on Sunday and Monday forenoon. None of the persons to whom it was sold up to Monday noon, July 20th, manifested any signs of poisoning. Monday afternoon four or five sales were made, going into as many different families. So far as could be learned all the persons in these families who ate of the meat had the violent toxic symptoms above stated, while other members of these families who ate at the same tables, but did not eat of the meat in question, escaped. The temperature from the 18th to include the 20th, was seventy-three degrees, eighty degrees and eighty-four degrees, respectively, with a good deal of moisture in the air.

The symptoms were significant of tyrotoxicon poisoning, and the long exposure of the cooked meat during the hot weather was highly favorable to the development of this ptomaïn. Specimens of the meat were sent to Professor Vaughan, of Michigan University, Professor Rockwood, of the Iowa University, and Professor Macy, of Highland Park College, Des Moines, for investigation.

Professor Rockwood reported that he had not been able to find any ptomaïne or tyrotoxicon in the sample sent him. He further said: "Not being successful I made two extractions, injecting the resulting product into young rabbits with no apparent inconvenience to them. It is quite possible that the meat might have contained ptomaïnes, and they have changed before the analysis to harmless compounds. We know that many of them are extremely unstable."

Professor Macy reported as follows:

Dr. J. F. Kennedy, Secretary State Board of Health, Des Moines, Iowa:

DEAR SIR—I beg to report as follows upon the investigations of the poisoned meat submitted to me for examination some weeks since:

The examination was first delayed because the college was changing hands and the laboratories were not supplied with water, and could not be used. When the laboratories were opened I made an extraction and obtained chemical evidence of ptomaïnes, but could not obtain it in quantity; nor did I try a physiological test at that time, because of the absence of a suitable subject; but about a week later I obtained a small kitten and then made another extraction. This time I failed to obtain even chemical evidence of ptomaïnes. I think that had there been ptomaïnes present when the meat was eaten by the parties who were afterward taken sick; that by time and exposure it would lose all the ptomaïnes through their decomposition. Professor Vaughan cites two cases where tyrotoxicon was known to be present and the entire quantity disappeared in a very few hours upon exposure to light and air. In all such cases it is absolutely necessary that the meat or milk be kept in a cool, dark place, if it cannot be analyzed at once. In this way only, can the decomposition be prevented.

If I am correct, the meat submitted to me for examination had been exposed to air and light at various times before it was delivered to me. This may account for the disappearance of the ptomaïnes.

Very respectfully, S. R. MACY.

THE SABULA CASE.

Dr. R. A. Crawford, of Miles, has furnished a clinical history of the remarkable Sabula food poisoning epidemic referred to on page 6. It is an interesting and noteworthy case.

The most extensive and serious outbreak of food poisoning ever recorded in the history of Iowa, occurred in the eastern part of Jackson county, in the fall of 1895. On September 11th, at a farm house three miles from

Sabula, there assembled about three hundred guests to witness a marriage ceremony and partake of the good things provided for the occasion. Within a few weeks thereafter, over one-third of the entire company were sick and seven deaths had occurred.

That the disease had its origin at the wedding could not be doubted, as there was absolutely no serious sickness among the scores of families who were not present on that occasion, nor had the health of the community been better for years, than during the month preceding the epidemic. The house at which the wedding occurred is well located, and there is no history of disease having existed there for many years. The water supply was drawn from a deep well drilled in the rock and so located that drainage or surface water could not contaminate it. The well was in constant use by the family and servants, while all remained in their usual health until after the wedding. An effort was made to show that the disease had been carried to the wedding by some guests from a distance, and that the crowded rooms and heated atmosphere favored the rapid spread of the virus. That it was not thus carried is shown by the following facts:

First.—No such disease existed at the home of any of the guests.

Second.—No case occurred among the scores who were engaged in caring for the sick, during the five weeks following the outbreak, excepting such nurses as had also been wedding guests.

At the beginning of the sickness the writer was strongly impressed with the idea that the food was the source of infection, and as his investigations advanced he became fully convinced that such was the case. When the first few cases were seen it was thought we might be dealing with a late manifestation of ptomaïn poisoning, but as the cases continued to come down, this theory was seen to be untenable. It soon became evident that the disease was the result of the ingestion of food infected by some pathogenic micro-organism, the exact nature of which was yet to be determined. No examination of the food could be made, as the first cases did not come under observation until one week after the wedding, but the testimony of the guests was such as to convince the most skeptical that the meats were not in prime condition. The ham was served in sandwiches, and, I have reason to believe, was thoroughly cooked. The turkeys were killed the day preceding the feast; some of them were cooked the same day they were killed, while others were kept in the cellar until the next day, and then baked in the oven. The chickens were killed the day preceding the wedding, cooked in the usual manner, and as soon as cool enough to be handled the meat was removed from the bones, chopped, and placed in common earthenware jars. These jars were set on the cellar floor and allowed to remain there until brought up to be served, more than twenty-four hours afterward. The servants state that no ice was used about the meats, and that the cellar was badly infested with flies. The weather was extremely hot, the mercury ranging between ninety and one hundred degrees, Fahrenheit. The pressed chicken was too soft to be sliced, so when served had to be dipped out of the crocks with a spoon. That the chicken was undergoing decomposition, the following letter from one of the guests, a man of unquestioned veracity, would seem to establish beyond doubt:

DEAR SIR—The general, and I think I may say the universal, comment here is decidedly against the food, and I believe that most of them would so testify on the stand.

My own experience is this: I put a piece of the chicken, or at least what I supposed was chicken, into my mouth, and it was so absolutely filthy, slimy and putrid to the taste that I spit it out and ate nothing else.

I might add many more such statements, coming from the most reliable people in the community, including the officiating minister and his wife, but this is unnecessary. That some of the guests detected nothing wrong with the meat I am free to admit, and the only explanation that can be offered is that it was not all equally bad. A few of the sick denied having eaten any of the meats, but these exceptional cases may be explained by the contamination of other articles of food and drink.

An effort was made to direct attention to the ice cream as the probable source of infection, but a careful investigation failed to sustain this claim. The cream was furnished by a vendor in Sabula, and as only a part of the quantity prepared was sent to the wedding, the remainder was disposed of to parties in the town, all of whom remained well.

A peculiarity of this epidemic was the great variation in time between the ingestion of the food and the first symptoms of disease. A careful study of forty-five cases, most of which were under the writer's care throughout the entire period of their illness, gives the following data: Of the cases, fifty per cent came under observation between the fourth and tenth day after the wedding. Almost all of these began to feel ill on the fifth or sixth day, but many of them were able to continue their vocation for a week longer. Three taught school for a week after the first symptoms appeared. Between the tenth and twentieth day, thirty per cent more came down, while the remaining twenty per cent continued in their usual health until between the twentieth and twenty-eighth day. Those that became ill during the third and fourth week were apparently as severe cases as those that were taken sick earlier. In seventy-five per cent of the writer's cases, the highest temperature was reached on the first or second day after coming under observation. The average temperature, when first seen, was $102\frac{5}{10}$ degrees Fahrenheit. The highest temperature reached was $105\frac{4}{10}$ degrees Fahrenheit. The average duration of the fever was eighteen days from the date of the first visit. The mildest cases were feverish for a day or two only, while in the most severe cases the temperature did not reach normal for forty days. Over twenty per cent of the sick were not confined to their beds, but assisted in caring for those who were more seriously ill. A few of the mild cases were apparently as well as usual in ten days, but the larger number remained weak and miserable for a much longer time.

The appearance of the tongue varied in different cases, and in the same case at different stages of the disease. In most there was a heavy white coating; in others it was brown, while in some it was denuded of epithelium, and was dry and cracked. Of a few patients, the tongue was so swollen as to make speech difficult. A fecal taste was complained of in some, and I found the patients scraping the tongue with a knife to get rid of this very offensive symptom. Vomiting was present in fifty per cent of the cases, while it was very persistent and troublesome in about ten per cent. Diarrhœa was present in about thirty per cent of my cases, the passages being mostly of a greenish color and a very offensive odor; but constipation was the rule, and laxatives or enemas were often called for. Tympanites was not a prominent symptom, and in but a few cases required treatment. Hemorrhage from the bowels was not met with in any of my cases. Epistaxis

was noted in eighteen per cent. A rash was present in six cases out of the forty-five. In three of these, only two or three spots were discovered, while in the others the rash was more abundant and characteristic. Profuse sweats were a striking feature of the disease, and the odor was so extremely offensive that frequent changes of clothing were necessary for the comfort of the patients. In fifteen per cent of the writer's cases, delirium was present, but in most of the cases it was of a mild character and of short duration. In the fatal cases this symptom was constant toward the last. No serious pulmonary complications occurred, and only in a few cases was cough a troublesome symptom. Pain was the most prominent symptom in seventy-five per cent of the cases. Some patients located their pain in the region of the umbilicus; others suffered but little from abdominal pains, but intensely from pain in the muscles of the extremities. The writer saw cases where the arms were almost as useless as if paralyzed and were exceedingly tender to pressure. In one instance, he found the patient with mustard drafts upon the forearms, so intense was her suffering. Swelling of the muscles was noticed by some. Dr. Pettit of Cedar Falls, who had two of the victims under his care, reported such a case to the writer. Hypodermics of morphine were necessary to control the pain in a number of cases.

The mortality was six per cent. All the fatal cases were under thirty years of age and four were between fourteen and twenty. Two deaths occurred in the third week, three in the fourth, one in the sixth and one in the seventh. The last death was from perforation of the bowels. There was evidence of profound toxemia in all the cases that proved fatal.

In two cases post-mortem examinations were made under the supervision of the President of the State Board of Health. The first body examined was that of a girl of fourteen years, who died about the end of the third week. The following is a brief history:

L. W., aged fourteen years. Always enjoyed good health. She was taken sick the fourth day after the wedding but continued in school a week longer. She consulted me six days after she began to feel bad, when I found her temperature one hundred and three degrees, pulse one hundred and thirty-four. She complained of very severe pain in stomach and bowels; pain in eyes; general aching; nausea, etc. Between this and the date of her death sixteen days later, the temperature ranged between one hundred and two-tenths and one hundred and four and two-tenths degrees, often fluctuating two or three degrees in twenty-four hours, but with no regular curve. Constipation continued until the last week, when a very troublesome diarrhœa set in. The passages were of a slimy character, green color and very offensive odor. Hypodermic injections of morphine were necessary to give relief from the severe abdominal pain. The immediate cause of death was progressive heart failure, the result of the profound toxemia.

At the post-mortem examination the heart and lungs were found to be in a normal condition. The liver was decidedly enlarged, soft and lighter in color than usual. There was some enlargement and softening of the mesenteric glands and ulceration and softening of the cœcum. The mucous membrane of the colon, for three inches below the cœcum, was found to be injected and softened but showed no ulceration. The kidneys were healthy; the spleen enlarged, softened and very friable. The stomach presented evidences of inflammation throughout, but no ulceration. The duodenum was normal in appearance and pancreas healthy.

Portions of the various organs and of the muscular tissue were sent to the State bacteriologist and to Chicago for microscopic examination.

The second case was that of a young man of eighteen years of age, who had been sick for six weeks. During the third week his temperature declined to a point but little above normal, and it was thought that he would soon be out of danger. A severe nervous shock occurred at this period, and his temperature soon rose to one hundred

and four and two-tenths degrees and continued high until death. Early in his sickness he suffered considerably, but after the relapse he did not complain of anything. Delirium of a mild character continued during the closing weeks.

The post-mortem examination showed the heart and lungs to be in nearly normal condition. The liver was enlarged as was also the spleen. The cæcum and colon were ulcerated throughout their entire length, but there were no perforations. In the small intestine there were patches of inflammation but no ulceration.

Sections of the muscular tissue and of the various organs were sent to the State Board, to Dr. Le Count, of Chicago, and to Dr. Hildreth, of Cambridge, Mass., for microscopic examination.

The report of Dr. William Royal Stokes, of the Boston City Hospital, who examined the specimens sent to Cambridge is very full and complete. His anatomical diagnosis is as follows: "Typhoid fever: broncho-pneumonia; general infection with the pneumococcus."

This report is in harmony with that made to the State Board by Professor Bay.

Dr. Le Count reported embryonal trichinæ, when the specimens from the first case were sent him, but undoubtedly failed to find confirmatory evidence from his examination of the second, as he made no report.

Late in the Fall the writer treated ten cases of typhoid fever, all of which occurred in families where one or more of the wedding victims resided. Nine of the patients were taken sick between the sixth and ninth week after the outbreak, at a time when nearly all of the other sick were convalescing. All these were typical cases of typhoid—no symptoms being wanting—and were in striking contrast to a similar group of the wedding victims. But two cases were seen outside of these homes, during the succeeding six months, so that no doubt could exist regarding the source of infection. If we accept the conclusion that the malady was typhoid, we must admit that it was a very peculiar manifestation of the disease. One of the leading physicians of Clinton treated three cases as remittent fever. Two other physicians, after seeing a number of cases, independently reached a diagnosis of trichinosis. Dr. Le Count, of Chicago, assured the writer there could be no doubt about the epidemic being one of trichinæ poisoning. Dr. Pettit, of Cedar Falls, had two cases under his care and reached the same conclusion. Two of the local physicians made a diagnosis of relapsing fever, while others preferred to wait until the evidence was all in before making a positive diagnosis. Some of these physicians have treated scores of cases of typhoid during the past twenty years, and it seems strange that they failed to recognize the nature of the malady. If the specific bacillus of Eberth is insisted on as being essential to the production of the disease, it remains and must ever remain a mystery, how the meats became infected therewith, as there had not been a case of enteric fever in the community for nearly a year prior to this outbreak.

The treatment, it is needless to say, was determined largely by the diagnosis.

A number of communications were received from Sabula and the surrounding country suggesting probable causes for this outbreak of the disease.

One of the causes emphasized by several, was an alleged condition that might easily account for the typhoid infection.

It was stated that the prepared chicken after being placed in jars in the cellar was for some time exposed to a visitation of flies. It is well known that flies are great scavengers. They are active, and often in a short time travel miles in search of desirable food. It is very possible and, if the alleged facts are really true, it is highly probable that some of the visiting flies may have been fresh from the dejecta of some typhoid fever patient, and thus by their infected feet, and their own discharges, have deposited the germs which under the favorable conditions of excessively hot weather, and the moisture of the meat, would soon infect a large portion of the food. Some portions would doubtless escape contamination, and thus some of the guests might partake of the meat and yet not realize any bad effects.

Attention is called to an extract from the *Public Health Journal:*

Two cases of poisoning from decomposing animal food have recently occurred in Michigan ("*Mod. Med.*"). Both cases were reported to the State Board of Health, and placed in the hands of Professor Vaughan, superintendent of the laboratory of Hygiene at Ann Arbor, for investigation.

In one of these cases a number of persons residing at Somerset Center, Hillsdale county, were poisoned by eating dried beef. Professor Vaughan reported at the last meeting of the State Board of Health that he found on investigation that the meat contained a small germ, which, when injected under the skin of rats, guinea pigs or rabbits, produced death in twenty-four to forty-eight hours.

In the other case of poisoning, which occurred at Sturgis, two hundred persons who ate of pressed chicken at a banquet were poisoned. The bacteriological study of the sample of chicken sent for investigation showed that it contained germs which, when injected into guinea pigs, produced death, although they were not sufficiently virulent to kill rats.

Cases of this kind are becoming more and more frequent, indicating very clearly that persons who use preserved flesh food must, under all circumstances, use extraordinary care to avoid serious or even fatal poisoning.

Dr. J. Dixon Mann, F. R. C. P., in the *British Medical Chronicle*, in an elaborate article on meat poisoning, says: "Meat may become poisonous in three ways; from the presence of disease in the animal at the time of slaughter; from microorganisms which attack or develop in meat after slaughter; and from the presence of ptomains. With the first two classes there may be a considerable period of incubation between the eating of the food and the commencement of symptoms; in the other class there may be a prolonged period

of incubation, if the meat after slaughter has been invaded by pathogenic micro-organisms. The author groups the symptoms produced by poisonous meat in two divisions—those due to a true infection and those due to simple poisoning. In the first division the symptoms run the usual course of an infective disease. A case is recorded by Walder (*Inaugural Dissertation*, Leipzig, 1879) in which six hundred persons were attacked after eating the flesh of a calf which was killed when moribund; the symptoms comprised headache, anorexia, photophobia, delirium, meteorism and enlargement of the spleen and the inguinal glands. Six died, the post-mortem appearance being that of typhoid fever. In the second group the symptoms usually resemble those of gastro-enteritis, with subnormal temperature; sometimes the temperature is elevated. Some toxins produce special symptoms. An atropine-like base has been described by Anrep (*Arch slaves de Biologie*, 1886) as having been met with in decomposing meat, most frequently in the sausages largely eaten in Germany, and in certain kinds of fish, as sturgeon. The toxin contained in the same meat may cause different symptoms in different people. An instance is related of ninety-seven persons who ate the meat of a cow which, when slaughtered, was ill of hemorrhagic enteritis. They were seized with symptoms like cholera, within four to forty-eight hours. Nearly as large a number ate of the same meat without any ill effects. It is to be remembered that some animals are insusceptible to some toxins. Gartner (*Thuringer arztliches Correspondenzblatt*, 1888) examined some beef derived from a diseased cow, which had caused an outbreak of meat poisoning, and found in it characteristic bacteria. Dogs and cats ate of the meat without being affected, while rabbits, mice, guinea pigs, a horse and a goat were made ill by it, some dying. It has been observed in several cases that if the flesh of an animal, in a certain stage of septic disease when slaughtered, be eaten shortly afterward, there may be no ill effects; but if kept for several days it becomes toxic, producing the usual symptoms of meat poisoning in those who eat it. Meat may be infected with bacteria after it has been cooked, as well as in the raw state. In some cooked meat which had been kept in an ice-safe *B. proteus vulgaris* has been found, these micro-organisms having been previously present in the safe. Foster (*Centrablatt fur Bacteriologie*, vol. XII) has shown that certain bacteria not only live in melting ice, but also grow in it. The temperature of an ice-safe is usually several degrees above the freezing point; hence some of the putrefactive bacteria, if accidentally introduced into the safe, may multiply and contaminate the meat. The percentage of deaths is difficult to estimate, as the number of persons attacked is frequently not stated, the fatal cases only being recorded. The wide variation in the mortality of outbreaks is very striking—ranging from twenty-six per cent down to zero. The table given in a recent number of the *British Medical Journal* (1894, vol. II, p. seven hundred and twenty-five) shows a mortality of about 4⅘ per cent. Regarding the preventive measures relating to meat poisoning, the author especially advocates a stringent supervision of the lower class butchers, particularly in large towns, who are apt to buy diseased and even dead animals, which are converted into meat and sold at cheap prices to the poorer classes. In private houses the cellars, larders, and all places where meat, cooked or uncooked, is stored, should be kept clean, dry, and well ventilated; they should have no communication, direct or indirect, with drains. The author calls attention to the danger of buying meats already cooked, such as potted meats; these being cooked in large masses there is danger that the heat which ordinarily applied in the cooking process will kill disease germs, has not in these large pieces reached fully and equally every part of the meat—an objection of especial force if spores be present, as they are more resistant than the micro-organisms themselves."

HYGIENE AND HEALTH IN PUBLIC SCHOOLS.*

Dr. G. Stanley Hall has said: "What shall it profit a man if he gain the whole world of knowledge and lose his health?" In our public schools, especially in the high schools, many a promising young life has been sacrificed by over-study. The system of marks and medals, now happily disappearing from many of our best schools, has driven many an ambitious boy and girl to an early grave at the point of a pencil, because that system stimulates those very pupils who need no spur and

*Prepared for the Committee of Twelve on Rural Schools of the National Educational Association, by A. P. Marble, of New York City, 1897.

whom the spur injures. More frequently the health of pupils is injured by ignorance of the most obvious laws of health, or by criminal neglect of those laws, and by the impure air of schoolrooms. Unsuitable furniture which cramps and distorts the growing bodies of children, and poor light which impairs the sight, have also a long account to settle with children thus ruined for life.

The evils of unsanitary schoolhouses have attracted most attention in the crowded schoolrooms of cities, but these evils are not confined to densely populated places. They appear equally in the rural districts, and they are less known only because the cases of injury are scattered, and the statistics are less easily obtained.

The vigorous country boy and girl may for a time resist the evils of a schoolroom, alternately too hot and too cold; of drafts of cold air in Winter through cracks in the floor and poorly-built walls; of outhouses too filthy for use and sources of moral defilement; of seats and desks, built for cheapness and not for comfort, and more like racks for torture than like a proper resting place for the growing bodies of little boys and girls. But however much the injury may be concealed, the deadly work goes on in many a country school. Take a single instance. Many a man has suffered for years from hemorrhoids brought on by ignorance or neglect in childhood; neglect, because proper accommodations were not provided or not properly cared for at the schoolhouse; ignorance, because the school gave no instructions in hygiene — not the technical hygiene suitable for physicians, but the obvious, ordinary hygiene that relates to clothing, proper bathing, eating, and the excretions.

Physiology is now required by law to be taught in the schools of nearly all the States. As too frequently taught, it concerns itself about the chemical effects of certain substances upon various parts or processes of the body. Such a treatment of the subject is too abstruse for children in the schools, it goes beyond their knowledge and their experience. They need to be taught the effect of green apples upon the stomach before they are taught the effect of alcohol upon the brain. We ought to learn wisdom from the concrete teaching of nature about eating green apples in her monitory pains. People mean well when they teach the evil effect of alcohol to little boys and girls who do not know what alcohol is. It would be better to teach these children the good effect of wholesome food and

drink, and especially to teach them that the whole alimentary canal should be kept in healthy, regular, and daily movement throughout, and to teach this and all that relates to the necessary bodily functions with delicacy and propriety, and without any squeamishness. Is any teacher too delicate, cultured, and refined a lady or gentlemen to give this instruction concerning the bodies of the children? Then let them be relegated to the land of spirits, to teach where the mortal coil has been shuffled off. It is high time to inaugurate a campaign of hygiene, and not the least important branch of child study is the study of their bodies, and how those bodies may be made in school to grow strong, robust, healthy, natural, at ease — "the temple of the living God."

In making the many advancements in education in recent years the pedagogical literature of the past three hundred years or more has been ransacked, and the educational philosophy of many eminent and venerable teachers has been exploited to constitute the new education — Comenius, Pestalozzi, Froebel, Herbart, and the rest; it is worth while now to bring to the front the maxim, "Mens sana in corpore sano," and to found an educational philosophy on that. Already we have physiological psychology which seeks to trace mental phenomena through a study of the brain, and missionaries are now learning to convert the heathen by making their bodies comfortable without their eating the missionary. Benevolence now seeks to raise humanity, both intellectually and morally, by first improving men physically. Let the schools follow the lead of philosophy and of religion in this regard.

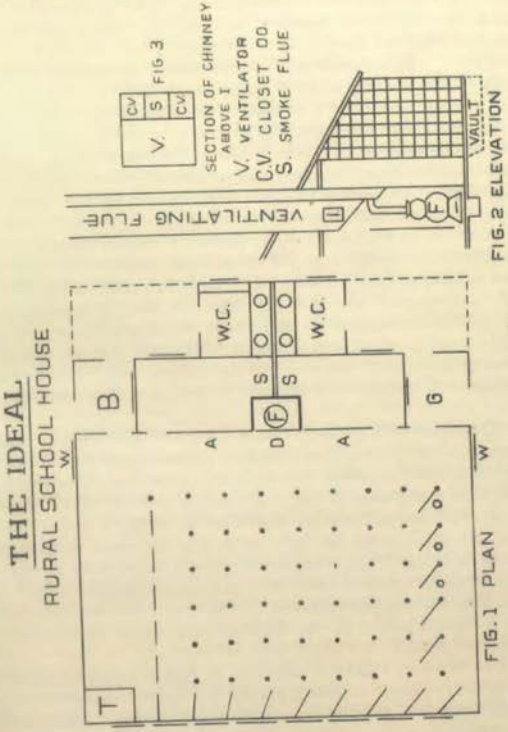
It is well known that no child can learn well or grow mentally when in bodily discomfort. Dullness, uneasiness and consequent disorder in a school, are directly traceable to vitiated air. If the body is numb with cold, if the feet are damp and chilled, the mind becomes stupid; and the sweltering heat of a badly ventilated schoolroom, the uneasiness of an over-loaded stomach, of constipation, and of uncomfortable clothing, will produce the same result. Moreover, an abnormal condition of the body is often the source of immorality. We blame the first Adam too much; the real Adam is nearer home, and of this generation and every generation that neglects the laws of health. The out-buildings of ill-governed schools with ill-taught children sometimes give evidence of fearful demoralization, and the demoralization is contagious, like a plague.

An important part of school hygiene, then, relates to the lavatories or water-closets. This is not the only, nor perhaps the most important, part of school hygiene, but it needs emphasis most at present, because it is nearly always neglected. In rural districts the outhouse is generally located in a remote part of the grounds, where its offensiveness may not interfere with the school, and it is the prey of tramps and bad boys who delight in defiling it. The closet should adjoin the schoolhouse, and be accessible through the house only. This location would compel its being kept inoffensive, and make it easy to do so. It should then be used by every child with the same freedom as at home in a well-regulated family. And the child should be taught in school to respect his body in every part and in all its functions—that nothing about it is defiling unless he himself makes it so; and that, while we are animals, we should be rational animals, and not brutes. Such teaching should not be indelicate nor obtrusive; but it is important, because respect for the body is at the foundation of self-respect and true manliness. This special teaching of hygiene has often been neglected through a false modesty which is highly indelicate, and which is itself the evidence of an impure mind.

For health, for comfort, and for intellectual and moral well-being, the schoolhouse should be well-constructed and suited to its use. It should stand in the middle of the grounds, high, well drained, and ornamented with trees and shrubs. The well should be so located as to supply pure water. The architecture should be simple and show a refined taste, for the schoolhouse is an educator. It should be as convenient and as well built as the best homes, in order that the children of the well to do may not despise it, and in order that the children of the poor may see how the best people live. The schoolhouse will thus become an inspirer in the young to higher living, for education is more than learning from books. It is a training also in how to live.

Churches are built as an example of noble architecture, to be an object lesson leading upward to a higher life. They are usually grander than the houses of the worshipers, and the poorest man in the congregation has an ownership in them. Municipal and state buildings often display, or are meant to display, the community's ideal of a home for itself. And so the schoolhouse should exhibit the taste, and to some extent the aspiration, of the neighborhood. It should be a little better than the best dwelling house.

Below is an attempt to show the least that should be tolerated in any community where the Americans of the future are to be educated. The ideal room may be repeated in a single building to any number below sixteen or twenty.



This plan provides for forty-eight pupils—one desk and chair in each of the squares, 3 feet by 3 feet, indicated by the dots. The desks at front are at right angles to the wall, and each succeeding desk toward the back is at a greater angle than

the last, till about forty-five degrees is reached at the last. The teacher's desk is at T, in the left front. The surface of the floor is 720 square feet, or 15 square feet each for forty-eight pupils, which is the least allowable. If the room is 13½ feet high its contents are 9,720 cubic feet, or 200 cubic feet each (the regulation number), and only 120 cubic feet for the teacher when all the pupils are present.

FIG. 1. This represents a schoolroom 24 feet by 30 feet, with (B) boys' entry and (G) girls' entry. The entire south side has a series of windows as near each other as the construction will permit, and extending to within three or four feet of the corners of the room. These windows should be three or four feet from the floor, and they should extend entirely to the ceiling of the room. Only the two outer ones need to be built so as to open. In cold climates all the windows should be double.

Near the entry door, both on the boys' and on the girls' side, another door leads into the cloakroom, which is 11 feet by 6 feet in size, and each cloakroom is provided with a sink (S) and two windows, five feet from the floor, one looking into the entry opposite a corresponding one above the outside door, and the other looking into the back piazza. The last of these windows must be stationary; the one looking into the entry may be open in Summer, but never in Winter, for a reason that will appear later.

From the entry on each side of the house another door opens backward upon a piazza accessible in no other way, and enclosed with heavy lattice-work (shown in Fig. 2) or stout wire screens, and from this piazza a door leads into the closet, which is provided with a single window protected by heavy screens.

Each vault must be built as nearly air-tight as possible (preferably of brick), must be connected closely with the under side of the floors, and must have a ventilating pipe of galvanized iron leading from the end of the seat at the top and entering a separate flue in the chimney next to the smoke flue, as seen in Fig. 2.

The furnace, F (Fig. 1 and Fig. 2), has a large stove, with 10-inch fire-pot (if for coal), enclosed in a brick chamber, some 3 feet by 3 feet, from which a door opens into the schoolroom. This door is six or seven feet high and three feet wide, and is very carefully protected on the inside with tin, or better, it may be made of tin or sheet iron. Above this door is a transom, three feet wide and two feet high, either open entirely or

filled with a screen of light wire and large mesh, and from the top of this transom and within the chamber or furnace a sheet-iron partition or diaphragm slopes backward, at an angle of about forty-five degrees, to back side of the furnace.

Below the stove, and in the bottom of the furnace, is an opening 2 feet by 2 feet, connecting with a fresh-air duct of the same size, that extends beneath the floor to the outer walls beneath the outside steps, where it must be covered with a wire screen and be protected from the dust.

The tin door of the furnace being closed and the stove heated, the air becomes rarified, rises to the top, is deflected by the slanting partition or diaphragm, and enters the schoolroom through the transom. At the same time the fresh air is supplied to the bottom of the furnace through the duct described above. This duct should be supplied with a valve by which it may be closed if necessary. The smoke flue of the stove is shown in Fig. 2, and behind it is the flue for ventilating the vaults.

But the warm air will not enter the room unless a corresponding volume of air is withdrawn at the same time; and this exhaust should be from near the floor, and on the same side of the room on which the fresh air enters near the top of the room. For the purpose of exhausting the vitiated air of the schoolroom, the furnace flue is extended upward through the roof, and it should be contracted near the top. This flue is represented in Fig. 2 (the large flue), and it will be heated by both the smoke flue on one side of it (which may be of metal) and by the diaphragm or slanting partition at the bottom. This diaphragm will be heated by the hot air impinging against its under side.

The vitiated air from the schoolroom reaches this ventilating flue as follows: The partition between the schoolroom and the cloakroom is raised 2 inches or 3 inches from the floor; on each side of the flue and above the diaphragm there is an opening of 18 inches by 24 inches, through which the air is exhausted from the top of each cloakroom, and as the doors and windows of this room are always closed (as said above) in cold weather, the vitiated air is withdrawn from the school room into the cloakroom, where the clothing is thus warmed and ventilated.

In order to secure warmth and perfect ventilation, it will be perceived that the floor of the schoolroom and the cloakrooms must be perfectly tight, and the walls should be lined with

brick, or otherwise made tight, at least three feet from the floor, and all the entry doors must shut very close. In other words, good construction is indispensable to comfort—both warmth and ventilation. It is for this reason that double windows are requisite in cold climates. All the warm air within which strikes the cold glass of a window is at once chilled, falls to the floor, and creates a draft. Moreover, the best lighted part of the room is close to the window, and the first row of seats may be placed near the windows, as shown in Fig. 1, if the window is double.

At night, and before the children arrive in the morning, the cold air duct and the ventilating flues (I) leading from the cloak-rooms may be closed. In that case, the door (D) of the furnace being open, the air within the schoolroom will come into direct contact with the stove, rise through the transom, and thus rotate throughout the schoolroom and warm all parts of it: and children may one by one warm their feet at the stove. But when the room is filled with children, the door (D) would be closed, and the fresh air duct and the ventilating flues (I) must be open in order that the stove may constantly heat the fresh air and ventilate as well as warm the room.

In Summer the diaphragm above the furnace may be raised to a vertical position; if then the door (D) be closed, the warm air of the schoolroom may pass upward through the transom and the ventilating flue, while the fresh air is supplied through the entry doors and windows, at W W (for this purpose and not for light), and through the two windows that may be raised in the front. In mild weather or on damp days a fire in the enclosed stove will help to produce the upward draft without heating the room.

A pailful of dry earth must be thrown into each vault every day, and the contents of the vault must be removed every week. This can be done by sliding outward a water-tight trough made for the purpose and fitted into each vault. These troughs should then be replaced, and each door through which the trough is drawn should be securely locked.

The house should have a dry, clean, and warm cellar; but where this cannot be afforded the house should stand on a sufficient number of posts two or three feet high and boarded around to the ground. These posts, and especially the foundation of the chimney and of the vaults, must be absolutely secure from frost, and the floors might be boarded below the joists and

plastered between; and there must be felt or thick layers of paper between the floors. A cold floor is costly and dangerous; and the cold schoolhouse costs more in the end, in health and in fuel, than it costs to build a tight, warm house at first.

As to the light. The best light for the pupil comes from the left, with no cross lights; but if the whole left side of the room is one continuous window, then the pupils in the back part of the room will face the light, though the window is at the left. To obviate this difficulty the first rows of desks might be placed with the axis at right angles to the window. After the first two rows, each desk is placed with its axis at a greater angle than the last, till the last row is at an angle of forty-five degrees. Such an arrangement is novel, but upon reflection there seems to be no necessity for the prevailing rectangular placement of school desks, with the teacher at the middle front. In this plan the teacher is at the left front of the pupils at T, and the oblique situation of the desks is shown. This position requires chairs and not shelves for seats—the only rational seat; and there is no excuse for any but adjustable seats and desks.

The best light is from the top of the window. A window properly lights the room only at a distance of one and a half times its height. The south light is the best. The north light is too cold in Winter and lacks the effect of the sun's rays in the room—chemical and hygienic effects not explained, but known to exist. The east and the west window admit the slanting rays in the morning or afternoon. In Summer, though the rays are hot, they are nearly vertical at noon and do not shine directly in at the windows of the south exposure. But there should be very light shades to roll from the top and temper the light when it is too bright, and dark shades to roll from the bottom to shut out the light sometimes—to shut it out from the bottom because, as said above, the light from the top of the window shines across the room. An awning of white cotton cloth on a rectangular frame outside the window would be inexpensive and worth many times the cost in a single Summer.

Any intelligent carpenter could build a house like the one described, and if some architect would build into it only a little good taste and chaste beauty, the house as well as the teacher would be an educator and a public benefactor.

THE DOCTOR AND THE SCHOOLS.*

The public school has more to fear from its friends than from its enemies. To condemn it as a nuisance which ought to be abated is to fight it openly and above board. We can meet our enemies in the field and defend our position. But it is a much more difficult task to ward off the attacks of those who criticise whatever does not square with their own notions or who, knowing only a part, proclaim the worthlessness of the whole.

Thus a physician of some prominence, said to me the other day, "Your schools are filling our insane asylums with patients." To which I might have replied, "You doctors, through your blunders, are sending half your patients to the graveyards, when if you had let them alone, they would have recovered." One story would have been as true as the other, and both of them equally false.

I cannot defend the schools against every charge, but in the name of thousands of conscientious teachers, who are striving faithfully to do their duty and who sincerely regret the tendency to crowd the brain at the expense of the heart and body, I do protest against the tendency to charge up to them and the school system all the evils to which childhood is heir. One physician would not have children go to school until they are seven or eight years of age. When asked, "What would you do with them in the cities and villages where parents are at work?" he replies, "I don't know." The fact is, he had never thought of that. Another one would have them in school but half the day, and when asked, "What of the rest of the time?" replied in the same strain, "I don't know." These men were honest, but neither of them grasped the entire situation.

"What is the full duty of the State to the child in a republican government?" has never yet been fully answered. It has not yet been fairly considered. It is very easy to find fault. Undoubtedly if Gabriel should blow his trumpet to-night, some one in this audience would exclaim, "This is the result of the public school system."

* By Henry Sabin, Superintendent of Public Instruction. Read before Iowa Public Health Association, at Davenport, May 19, 1896.

We must not forget that the public school is here to stay. It cannot be supplanted by any system of church, parochial or private instruction. If all the Christian churches in Iowa should combine to educate each the children of its own communion, there would still be one-half the school population to be cared for by the State. I mention this only to illustrate the necessity of considering calmly and with great deliberation those questions which concern public education.

The question naturally arises, what does a schoolmaster know about medicine. Nothing whatever, except to let it alone. For that reason he is of all men most competent to talk about it. Talk about those things of which you are supposed to know but little, and the world will excuse your mistakes; but when you talk of those things in which you are supposed to be an expert, every mistake will be as a dagger thrust between the ribs of your reputation.

There is no science which has made as great advancement during the past fifty years as that of medicine. The old list of salts and senna, of jalap and aloes, of calomel, rhubarb, emetics, blisters, belladonna, morphine, leeches, and lancet, has given place to newer and more simple remedies. The skillful surgeon will take a living subject all to pieces, joint by joint; he will disembowel him, cleanse the cavities with some antiseptic preparation, and put each organ back into its proper position. He will split a man's skull in twain and wedge it apart permanently, in order that his brain may have a chance to expand and grow. The dentist will extract his teeth, fill them, and insert them again in their cavities; the oculist will take out his eyes, turn them inside out, and put them back in their sockets.

It is no longer necessary for a man to die in order to be dissected. The time is coming when the living subject will willingly place himself upon the dissecting table and allow the surgeons to take him to pieces, provided they will compensate him for his time and trouble.

It has been the duty of the doctor in the past to heal the sick, to relieve us of our aches and pains, to thwart that penance which nature thrusts upon us for the violation of her laws.

In the future the physician's art will consist largely in keeping men well, in warding off sickness, in preventing the

spread of disease among the people. He will not study therapeutics less, but hygienics more. He will be considered the most successful physician who has the fewest patients. Men will pay for being well, and not as they do now, for being sick.

The coming doctor will not alone seek for the remedy, but will give himself no rest until he has searched out the cause. That outbreak of diphtheria or typhoid fever in the neighborhood calls for something more than simply curing the disease. Somewhere, in some well, which is the common resort of the people for water, in some connection, hitherto unsuspected, between a vault and a hidden watercourse, perhaps in that stagnant pool which for years has been the receptacle for vaults and barnyards, and graveyards possibly, of that region, somewhere is there a hidden cause, and the physician will have skill and intelligence enough to discern it. To-day a few cases of scarlet fever or diphtheria in a neighborhood calls for closing the schools until the disease is stamped out, and then the school is reopened without that careful inspection and investigation of the building and its surroundings which alone can insure the children against a renewal of the disease. Is that common sense? Is it not criminal carelessness?

The coming physician will hold himself so strictly accountable for the health of the community in which he resides, and especially of the families and their children under his charge, that he will regard the outbreak and spread of any of the contagious diseases which are now so dreaded, as a reflection upon his professional skill. The children of the village school are pale, languid, and complain of headache. What is the usual diagnosis? Too much study, too close application. That, by the way, is not one of the diseases laid down in medical books as incident to childhood. What is the remedy? Take them out of school and criticise the teacher for overworking the pupil. Before the doctor makes this diagnosis of the disease, he should be more sure of his ground than he usually is.

There is no more important question before us to-day than the ventilation of schoolrooms. Pure air under all conditions of life is an absolute necessity: but when thirty, forty, fifty, or even sixty children are shut up in a schoolroom, many of them coming from homes where the bath tub is a luxury unthought of, and often the garments are worn day and night, perhaps unwashed for weeks, only the most complete forced ventilation can keep the air decently pure. The problem is intensified

when we remember that to the impurities arising from the usual causes, we must add those from catarrhal breaths, diseased stomachs, decayed teeth, and uncleanly persons. The chalk dust from the blackboards must not be forgotten. It is a very liberal allowance to say that in the average school of forty pupils where there is no ventilation the air is unfit to sustain vigorous life at the end of the first five minutes. Yet in all this State there are comparatively few schoolrooms, in the building of which the supply of fresh air has been taken into account. This is as true in the city as it is in the country. The next time, my good physician, that you find the children in a family under your care are puny and white, order them taken out of school, and kept out of doors as much as possible, but give credit to the fresh air and the sunshine for their cure, rather than to your skill. In the meantime, if you understand your business and are searching for causes as well as results, visit the school which the children attend, if you think you can endure the sight of so many young immortals killing themselves by hard study. The first breath of fetid air will make you faint, but persist and go in. Here you will find a room twenty-eight feet by thirty-two by twelve, heated by a vicious soft coal stove, or an equally vicious hot air furnace, and absolutely with no means of ventilation, except by lowering the windows. This the teacher hesitates to do because a blast of cold air slays like a sword. I say, no means of ventilation. Possibly you will find a hole in the ceiling, seven by nine inches in size, or one of the same dimensions in the side near the chimney, which for ventilating purposes is of no practical use whatever. In this room you will sometimes find seventy pupils—two, often three, at one desk. If you happen to find a thermometer it will register possibly from seventy-five to eighty degrees.

The cracks in the walls and in the floor are filled with the accumulated dirt of many terms, the best possible breeding place for disease germs, bacteria, or whatever name may be most appropriate. The floors have not been washed for weeks, months, perhaps years. The desks and seats have not tasted hot water since they were screwed into their places.

In Germany recently an examination of the scrapings from under the nails of thirteen school children revealed the germs of fifteen distinct diseases.

Pull up a board from the floor, so that the nostrils may have

the full benefit of the fragrant effluvia and you will find as many distinct and several smells as Coleridge found in the city of Cologne, and that I think was seventy-two. You remember his immortal verse—

"The river Rhine as is well known
Doth wash the city of Cologne.
But, O, ye nymph, what power divine
Can ever wash the river Rhine?"

Possibly you will find that the school authorities have dispensed with the outdoor recess and that the teacher has substituted for it a five minutes' gymnastic drill, which as a matter of exercise is about as beneficial as a long, deep, healthy yawn would be. I do not know who first suggested the idea of abolishing the outdoor recess. Whoever he was, he was no friend to children. There is nothing that can take the place of it.

Do not hasten to leave the premises until you have finished your inspection. You will likely find a water-closet, vile and foul as hades. The vault has not been cleaned for ages. The building ought to be purified by fire. Sensitive children avoid visiting it and thus injure their health, and if they visit it they injure their morals. Don't charge it all up to overworking the brain. I quote from the last report of the superintendent of public instruction: "Yet there are to-day in some districts conditions which would disgrace the civilization of the Apache Indians. If the women of Iowa who are so earnestly and nobly working in the caase of temperance instruction and patriotism, who are just awakening to a greater interest in the public schools, or the personal purity associations, would make an investigation along the lines indicated, they would possibly find a field of labor of which they have before had no conception."

The superintendent of public instruction for Maine says: "The condition of these hovels is so shocking that I feel justified in calling special attention, in strong language, to the duties of the towns in this connection."

This condition is peculiar not alone to our country schools, but it prevails in some of our city schools, and I am informed even in some of our higher institutions of learning. The principal of a school in one of the larger cities of Iowa, said to me within a week, "The closets are under the building, in the basements, and at times it is almost unendurable."

You are in no haste, so let us return to the schoolroom. Do you see that little girl writing at her desk? Observe that her

arm is elevated so as to be at right angles with her side, and that her left shoulder is correspondingly depressed. In a few months her mother will bring her to the physician to be treated for curvature of the spine. Do you think hard study did it? Wouldn't prevention be better than cure in such cases?

Now, notice that boy moving uneasily in his seat, swinging his legs as they dangle in the air. His feet are six or seven inches from the floor. How would you like to take his place and swing your feet for hours at a time? By and by his mother will take him to the doctor and tell him that Johnny complains that his bones ache and his feet are numb. That he is too tired and restless to sleep soundly as a child ought to sleep. The doctor prescribes a tonic and "take him out of school." An adjustable seat and desk would remedy both these evils and save the doctor's bill.

Go across the room and sit down beside that group of scholars. They are endeavoring to make out their lessons from the blackboard. You can get an indistinct outline of the writing and that is all. The pupils are squinting their eyes and twisting their heads and straining themselves to make out the writing, but the light strikes the glazed, shining board so as to give them the greatest possible amount of trouble. The time is near when those children must be taken to an oculist and have glasses fitted to their eyesight, which is permanently injured. The increasing shortsightedness is due very largely to the defective methods of admitting light, or to insufficient quantity in certain parts of the room.

Your time is up, but before you go it will take but a moment to convince yourself that some parts of the room have less light than is needed on cloudy days, and that there are no shutters or curtains to shield the eyes of pupils when the sun is bright; that some seats and desks are too high, and others too low; that blackboards are placed between the windows where the light is as bad as it can possibly be, and that the general arrangement of the room is in entire disregard of sanitary laws.

Ask one more question. Where do these children get water to drink? It is as important to have pure water at the schoolhouse as it is at the home. How far is it from the well to the vault? Fifty children, perhaps, must drink from two or three cups. Sometimes the water is passed about and all drink from one cup. Worse yet: if a child fails to drink all that is in the

cup, it is passed to the next or thrown back into the pail. Bah! it makes one sick to think of it, and yet various diseases are conveyed in this way. And the doctor wonders where the child contracted the disease.

I am not here to say that teachers are not at fault. They are, in many cases, ignorant of the conditions which promote healthy growth in children. But I am here to say that not one physician in ten is fitted to criticise the plans of a schoolhouse as to heating, seating, lighting and ventilation. Not one physician in ten ever thinks of making a thorough inspection of schoolhouses, school premises and school customs in order to ascertain either the cause of an outbreak of scarlet fever or diphtheria, or the reason why the children of the families under his care are not growing toward a sound, symmetrical, healthy development of the body. Not one school board in a thousand would ever think of submitting plans for a new building to a physician for approval. And yet if this does not come within the proper scope of the physician's business, what are physicians for, anyway? This is all the more necessary, because architects have only just begun to study school sanitation. For instance, the risers, including the tread of the stairs, should not be over five inches. They are generally seven, often eight. The treads should be twelve inches in breadth. They are often only eight or nine, and the stairs must be crowded into a certain space, no matter how steep they must be constructed. Everything should be made to give place to the sanitation of the entire building. Three-story buildings are going out of fashion, but in many places the little children are in a half basement, the window sills of which are level with the ground outside. The physicians who are accountable for the health of such children ought to protest and make their protest heard both by parents and school boards. To put little children in such a room is an outrage on childhood.

Do not misunderstand me as overlooking the course of study. It is too top-heavy; it is overloaded. Intellectual and social growth is forced. But teachers are not at fault. Every man who has a hobby makes a bee-line to the door of the nearest schoolhouse to experiment upon the helpless children. God bless the teacher, man or woman, who will stand up and protest against it. The introduction of so many special teachers is not productive of health, because each one crowds and nags the children to make special exertions in his line. The nerves of

the children give way under the pressure. There is too much home study, and there will be as long as every pupil must carry four and often five full branches, besides some extras. he fault is with the parents who will have it so. The piano is helping the school. Music has many charms for those who know and love its sweet mysteries, but to set a boy or girl who has no musical talent, to drumming two or three hours a day on a piano, would be ridiculous were it not sinful.

There are five points which I wish to touch upon in conclusion:

1. Our present duty is to establish in our schools right sanitary conditions, before we attempt to judge what evils are due to overpressure. There are seats which can be adjusted to the height of children. There are systems of ventilation and heating which are nearly perfect, but these all cost money, and unless there is a popular demand, school boards will invariably purchase the cheaper. Physical culture is not the present remedy.

2. Teachers are usually alive to these questions. They discuss them at their associations with interest and profit. The leading educators are better posted upon them than physicians are. I grant that they ought to be, but the needed reforms can be brought about only by the united efforts of the friends of public health everywhere. In this movement physicians should be in the foremost rank.

3. There is a demand for a professorship of sanitary science in our normal and medical institutions. The conditions which conduce to health in our school buildings should be included in the instruction given. The medical school and the normal school should join hands in this new crusade for humanity's sake.

4. The duty of the public schools is to train boys and girls so that they may become healthy, clear-headed, upright men and women, capable of producing and perpetuating a race of stalwart American citizens. To accomplish this, the doctor must reinforce the teacher. He should make himself acquainted with the conditions under which children study, so that he may intelligently advise parents and school authorities. The word of the intelligent physician should be law, and under his direction the pupil should be allowed to attend a half day, to drop some studies, or even to study at home and recite at school. But the physician should not place the school at a disadvantage. Under such conditions he should place a rigid restraint

upon evening parties, unwholesome diet, and insufficient sleep. All that the schools ask of the physicians is fair play.

5. I have discussed this question from the physical side because I think it is of the most immediate importance. I am aware that there are other lines along which we ought to push investigations and discussions. But we must first establish more favorable conditions before we can decide other matters which depend largely upon the sanitation of the school. Every schoolroom, whether public, private or parochial, ought to be carefully inspected and approved by competent authority before it can be used for school purposes. The State does not lose its interest in the child because his parents elect to have him educated in some other than a State school. Fewer children would be injured by hard study were the home life what it should be. Here the doctor again should interfere and forbid the dissipation and the exciting life to which children are subjected out of school. The brain, the seat of being, wonderful in its mechanism, mysterious in its work, is seldom injured when Nature stands as warder at its gates.

THE CESSPOOL ABOMINATION.

The numerous requests from various localities throughout the State during the biennial period for aid from the State Board to rid some suffering community from the nastiness, filth, corruption, and menace to public health of cesspools, evidence that they are still tolerated in some communities.

Strange it is, and well-nigh incomprehensible, that such should exist where there is a claim to civilization.

The foundation of sanitary science lies in three conditions:

1. Pure air.
2. Pure earth.
3. Pure water.

Destructive of them all is the pestiferous cesspool.

Throughout the State are groups of houses, large sections of towns, aye, even whole towns, where is general slovenliness in everything respecting the removal and disposal of refuse matter—a slovenliness which is menaceful and unaccountable; where, contiguous to houses, or common to many houses, is permitted to lie undisturbed, except perchance by rooting hogs, the rotting refuse of house life and trades; excrement of man

and brute; sometimes stored out of sight in drains and sewers which cannot carry them off; sometimes held in specially-provided pits and cesspools to favor accumulated rottenness.

In many a village garden may be seen cesspool and well side by side, environed with hog-pens, privies, and heaped accumulations of the horse and cow stables. Poison steals through the porous soil. The pestilence which walketh in darkness, comes at last, and panic reigns throughout the community. An inquest is held upon the epidemic. The old, old story is repeated — diphtheria, or typhoid fever from well poisoning. The well is closed, the water supply is cut off, but the cesspool continues, the process of infiltration, pollution, pestilence and panic goes on. The silent, unerring processes of nature are immutable. Trench upon the cause of it all, and there is vigorous protest that it is interference with modern ideas of civilization — the right to do as one pleases with his own. It has not entered the mind that the scavenger is less expensive than the doctor and undertaker — that prevention is cheap and certain; cure expensive and uncertain.

To the superficial observer on the surface these pollutions and pestilences may appear to be evils, but to the practical man who views them from the bottom of a well, they become public disasters and witnesses of culpable wrong-doing.

A cesspool is an abomination which should not be permitted to exist. One that does not at least pollute the air, is impossible of construction. One that is absolutely water-tight, periodically cleaned, and least objectionable, is expensive, hence seldom adopted.

It is however, the shallow pit, consisting of a hole in the earth, too often seen all over the State, against which this vigorous protest is made. Sometimes it is walled with loose plank, stone, or brick, the object being to allow the liquid matter to escape, under the popular, yet erroneous impression that the earth is an adequate purifier and disinfectant.

The presence of air and water in the earth is necessary for complete disinfection. The antiseptic properties of the earth about a cesspool are confined near the surface, while there is being poured into the soil a constant stream of pollution which spreads wider and wider with every rise and fall of the ground water. In fact so saturated may become the soil that it is not a matter of filtration but of dilution.

Universally over this State shallow wells furnish the water supply in town and country. The contamination and pollution from these cesspools, including open privy vaults, is a matter of general observaton. How far this pollution will traverse the soil and infect a well, has not been definitely determined, nor can it be. It depends upon the nature of the soil. Water will percolate all soil in all directions, but some more rapidly than others, and more freely with than against the dip of the strata, and the topography of the surface is no indication of the dip. One may have his well upon a hillside and the cesspit below, and assume that sewage will not run up hill. The fallacy of this is shown in Fig. 1. The supply of water in a well is dependent on the extent and permanence of the ground-water supply of the region. In the illustration the ground-water does not form a collection but flows slowly along the rock surface, and though the well-curb is at a higher level than the cesspit, it does not follow that the water is pure.

FIG. 1. A contaminated well with intermittent supply from the ground water.

It is estimated that by the drawing of two feet of water from a well, the horizontal suction radius extends from one hundred to two hundred feet, and it should be born in mind that this suction facilitates the spread of the pollution from a cesspit. Therefore, let a person take his well in any of the cities and towns in this State, as the center, and with a tapeline measure two hundred feet, as the circumference of a circle. Then count the privy vaults, cesspools, hog-pens, and barnyards within the circle, and he will have a very good idea of the reservoirs he draws from with every stroke of the handle of the pump or lift of his bucket.

One of the most notable instances of pollution of a water supply by long distance percolation is that known to all sanitarians as the Lausen case in Switzerland, exhaustively investigated by Dr. Hagler, of Basel. On the side of a mountain ridge was an isolated farm house. A brook ran past this house and was utilized entirely for the irrigation of meadows. The effluent water filtered through the mountain intervening to a spring at a lower level, the water from which was used by all the families in the village of Lausen except six. Suddenly an epidemic of typhoid fever broke out in the village. More than one hundred and thirty persons were attacked, but none in those families who used no water from the public spring. It was found on investigation that at the farm house on the mountain side a man had been sick with typhoid fever, and this brook had received the dejecta from the patient. To prove that this was the source of the sickness eighteen hundred pounds of salt was dissolved in the water distributed over the meadows, which soon after manifested itself in the water in the spring. Then several hundred pounds of flour were thoroughly mixed with the water, but not a trace of it made its way to the spring, thus conclusively proving that the water filtered through the earth nearly a mile and did not pass in an underground channel.

Mr. Childs, health officer for a certain district in Oxfordshire, England, reports a striking instance of contaminating wells from a source above their level. He says:

> In consequence of the escape of the contents of a barrel of kerosene, which had been buried in an orchard, a circuit of wells two hundred and fifty and three hundred yards distant became so affected the occupiers of fifteen houses, containing eighty-two inhabitants, were for ten days unable to use the water for drinking or cooking. Cattle refused to drink at the spring where they were accustomed to drink. Had this soakage been sewage instead of kerosene who can doubt the result might have been wholesale water-poisoning and an outbreak of typhoid fever.

In Kalamazoo county, Michigan, a site was selected for a cemetery. A neighboring lot owner objected on the ground that soakage from it would contaminate his well, thirty rods distant. To test the matter a chemist deposited lithium in the soil at the proposed cemetery site. Eighteen days after lithium was found in the water of the well, thus proving beyond question that the well would have been polluted by the poisons from decaying bodies in the cemetery.

In the city of Adrian, Mich., was a school, on the grounds of which was a well. There was also a basin into which was

thrown the slops, and which connected with a long drain. A pupil was sick with typhoid fever; some of the slops from this patient was thrown into the basin. Soon after fifty pupils were attacked with typhoid fever, and the cause was traced to typhoid germs in the water in the well, which had percolated through the soil from this drain pipe.

There is another form of cesspool, of which hundreds may be found in this State. It is the well cesspit. A person builds a new house, puts in the necessary fixtures and connects them with the public water supply. To save the expense of sewer connection he debouches the sewerage and waste from the house into the abandoned well, thus menacing other wells in every direction for a long distance. Such an act is really criminal. It may be done ignorantly, but it is none the less a crime.

As a measure for the prevention of the danger to the public health it is suggested that the following provisions be enacted in every incorporated city and town in this State. It would be better if they were made a part of the State statute:

1. That no refuse matter, sewage, waste, or other noxious or polluting thing shall be knowingly permitted to pass from any dwelling house, stable, or other building, or any farm, stock-yard, factory, distillery, creamery, slaughter house, or other premises, through any open drain or covered channel, into any stream, ditch, or natural water-course, or any basin, reservoir, or stagnant pool, unless such refuse, sewerage water, waste or other matters shall have been previously cleansed from all noxious and polluting ingredients.

2. That in all cities and towns where no special system of drainage exists, there shall be provided receptacles for temporary deposit of fœcal matters, waste, and rubbish, the contents of which shall be removed at stated times, and deodorized by layers of common soil. That the same shall at all times be kept so that it shall not be a nuisance or injurious to the public health.

3. That no cesspool, for the collection under ground of any drainage, filth, or other noxious matter shall be constructed, or permitted upon any ground, or premises, unless the same shall have been rendered water-tight, by means of cement or asphalt, or be distant not less than two hundred feet from any public or private well, spring, pump, or fountain which is used for drinking purposes, and that no well shall be dug or constructed within the same distance from any already existing cesspool, whether upon the premises of the owner of such cesspool or otherwise.

4. That no water closet shall be used or constructed in any dwelling or building until proper provision has been made for receiving and discharging the contents of the same so as not to be a nuisance, or dangerous to public health by the pollution of any wells, or water-courses, or otherwise.

SANITATION.

The word "sanitation" is comparatively new—especially to readers of official documents, and is to most of persons suggestive of measures that are undesirable if not repulsive.

It suggests hygienic laws that interdict many proposed pleasures. It hints at restraints, quarantine, isolation, preventive measures, health laws, health boards and many personal inconveniences. It suggests personal uncleanness, and soap and water as remedies. It suggests that many enterprises are conducted as nuisances, and demands their abatement. It suggests that the water, milk, food, and fruits that we use are liable to contamination, and thus likely to prove a curse instead of a blessing. It suggests that if we have small-pox, scarlet fever, or any infectious disease, we are, or some one else is, at fault. It suggests that most of the ailments that we have, instead of being mysterious dispensations of Providence, are palpable dispensations of improvidence.

Sanitation, like hygiea, may be impersonated as a ministering angel pointing out the roads to sickness; guiding her willing followers into and along the highways of health, and saying to pestilence and pain when menacing her faithful devotees, "Thus far and no further."

Few fully appreciate the value of health and the many are thus unable to properly estimate the kind services of sanitation. Steine says beautifully and forcefully: "Oh, thou blessed health! Thou art above all gold and treasure; 'tis thou who enlargest the soul and openest all its powers to

receive instruction and relish virtue. He that hath thee hath little more to wish for, and he that is so wretched as to want thee, wants everything with thee."

Sanitation, like "preventive medicine," is a broad term, and embraces all the measures recommended, or resorted to, to ascertain the causes of diseases; to determine the conditions most favorable to the incidence and spread of disease; to demonstrate and announce the means best adapted to prevent it, or, having appeared to stamp it out most promptly and efficiently.

Sanitation is then one of God's best gifts to man, one of the best friends of humanity; and it is well to enquire briefly as to what it has done and may yet do for mankind.

It has greatly improved the physical condition of the human family when its teachings are heeded and practiced. It has greatly increased the longevity of mankind and brought to its subjects a more comfortable old age. It has restricted the spread of infectious diseases so as to almost prevent epidemics. It has pointed out to plagues and malignant diseases their "metes and bounds." It has rendered small-pox, that used to be well-nigh universal, almost unknown and unheard of wherever vaccination and re-vaccination are properly resorted to.

There are thousands of physicians living to-day, who have been in practice for some years, who fortunately have never seen a case of small-pox.

It has nearly stamped out scarlet fever, that terrible dread of father and mother, until in many places of England, as well as of this country, years pass without a case occurring.

By isolation, quarantine and disinfection, diphtheria, whooping cough and measles, all bringing distress, disability, danger and death into so many homes, will soon, like small-pox and scarlet fever, be spoken of as reminiscences rather than experiences.

The most reliable and efficient sanitary measures against infectious diseases are few, and practically within the reach of all. They constitute a quintette which, if faithfully observed and practiced, would at once greatly reduce the number of cases of such affections, as well as render them much milder in type. The measures recommended are *cleanliness, vaccination, isolation, quarantine* and *disinfection.*

While *cleanliness*, implying clean bodies, clean water, clean air and clean food, is highly important, its importance and its

varied applications are so well known and so generally admitted as to need no further notice here, further than to earnestly commend its faithful and practical observance.

When an infectious disease appears in a family it is highly important for the community generally, as well as for the family so afflicted, that the patient be *isolated*—be either put into a room by himself or herself, as far removed as possible from the other members of the family, or else removed to a hospital; or else all others in the family who are susceptible to the disease should be removed. The removal of children or adults from a place where an infectious disease has broken out, into another family, is always fraught with more or less danger, because it is impossible to know whether the brief exposure, before removal from the home, even if disinfection has taken, was not sufficient to develop the disease. The great object of isolation and all restrictive measures is to prevent a second case if possible, and by prompt and thorough isolation this may generally be done, even where there are several children in the family.

With isolation, *quarantine* of the whole premises should at once be established, rigidly maintained, and only released by the proper health authority upon assurance of the complete recovery of the last case, the lapse of at least fifteen to seventeen days additional after such recovery, and thorough disinfection of the person and belongings of the inmates and of the premises.

This word "quarantine" is a terrible bug-bear to most persons. It should not be. It is a misfortune to have the sickness—a misfortune resulting generally from the wanton carelessness of some one else, or of the family afflicted, by improper exposure. The quarantine card is not a disgrace. It is but a signal of danger—a warning to others—especially to those having children, that there is danger to be avoided. The quarantine affords the mother a rest, generally a much-needed rest, from the exacting weariness of the customary social functions. It shuts her up with her children and gives the parents and children a splendid and too-often-needed opportunity to get acquainted with each other; and it also affords an object lesson in sanitation and preventive medicine that has a most salutary effect, not only upon the members of the family, but upon the community as well.

The last measure suggested is *disinfection;* and it is also a

highly important, if not the most important, measure of protection. Many imagine that disinfection means the removal of some foul odor—deodorization. It means the destruction, as completely as possible, of the germs of disease—the use of a germicide. Comparatively few of the so-called "disinfectants" so persistently advertised for commercial purposes are in any way reliable. The number of reliable disinfectants are very few. They are sunlight, heat, carbolic acid, bichloride of mercury, sulphur, quick-lime and formaldehyde. The last named has rapidly grown into public as well as scientific favor. Elsewhere in this report will be found an extended consideration of it. The means of application of these agents are simple, and should be known and promptly explained by any competent physician, or by the health officer of any local board of health.

Don't forget that cleanliness, vaccination, isolation, quarantine and disinfection, if faithfully observed, will save the people of the state millions of dollars annually.

THE IOWA HEALTH BULLETIN.

No one agency employed by the health department of the State has been more productive of good than the publication of THE IOWA HEALTH BULLETIN.

Issued as it is monthly it carries into thousands of homes information respecting sanitary matters that is fresh and from the best possible sources.

Copies are sent to all the district judges, to all county attorneys, to county clerks, to county superintendents of public schools, to all city and township clerks, to health officers, to mayors, to local health boards, to the superintendents of district schools, to the colleges and public institutions of the State, to libraries and to a great many physicians and laymen who ask for it. It is also sent in exchange to state boards, to sanitary associations and to sanitary publications, as well as to our representatives in Congress and to the members of our Legislature, requiring an edition of six thousand copies. It is the official organ of the Board, and in addition to the proceedings of the Board at its quarterly meetings it furnishes short, practical articles upon hygiene and sanitation that are not only

educational but are stimulative and encouraging by showing what has been done, what is now doing and what can be done by well directed effort in the way of preventing and stamping out entirely many of the infectious diseases that have no right to exist in any civilized community.

Though the publication of the BULLETIN entails a great deal of additional work upon the Secretary the expense is comparatively light and is entirely within the appropriation.

FORMALDEHYDE.

Every community and especially boards of health are interested in any and all measures tending to decrease the danger from contagious and infectious disease.

One of the most important of them is that of disinfection whereby the germs of disease are destroyed. Hitherto dependence has been had largely upon heat, and vapors generated from various substances, principally sulphur. The latter has been used principally owing to its accessibility and convenience, but results have been unsatisfactory.

1. Because it is unreliable as a germicide.
2. It injures fabrics and wall paper.
3. It is peculiarly obnoxious to respiration, rendering rooms in which it is used, unfit for use for considerable time.

Sanitarians and hygienists were therefore ready and pleased to receive the announcement of the discovery by Trillat, in 1890, of a process for evolving a gas (Formaldehyde CH_2O) from methylalcohol, which will destroy disease germs without damage to rooms, injuring fabrics, destroying colors, or tarnishing metals, except iron and steel. Possessing the highest germicidal properties, it has rapidly advanced to the front rank as an antiseptic, and become the ideal disinfectant. Its vapor almost instantly penetrates every crevice of a room, floors, bed clothing, wardrobes, closets, rendering innocuous all infectious materials. The accidental inhalation of its vapor, or even drinking the solution will not result injuriously. All of which commends it for use in every day life. Exhaustive experiments in every direction have been made, and the universal decision is that formaldehyde is the disinfectant *par excellence*.

IN SCHOOLS.

Schoolrooms may be daily disinfected during the periods of epidemics, and thus enable the schools to be kept open. The generation of formaldehyde vapor in the rooms will cause complete disinfection of all of the contents of the rooms, such as desks, books, wall maps, and blackboards. The cloak-rooms containing cloaks, hats, coats, rubbers, comforters, etc., of the pupils may be filled with formaldehyde vapor and thus disinfected while the pupils are at their lessons, rendering transmission of disease by this means improbable. Even the water closets may be rendered inodorous and free from contagion by this method.

IN THE HOME.

In the home the use of formaldhyde is accompanied by the highest advantages. The sick room may be disinfected by means of the generator, every piece of furniture being acted upon by the gas set free in the room. The nurse and relatives of the patient are thus greatly protected, and when convalescence from diphtheria, scarlatina or other contagious or infectious diseases sets in, the occasional visitor will run very little chance of carrying away any contagion. It is also of the highest advantage in the disinfection of rooms with their contained furniture when visitors, who may be suspected of having been exposed to contagious disease, have departed. Many persons innocent of knowledge or intent of conveying disease have carried contagion to families where they have visited. The instant sympathy which is shown to a stricken family causes well meaning friends, neighbors or relatives to visit the family and patient to offer services before the nature of the illness is known and wide distribution of contagious disease results. The innumerable epidemics of the world's history furnish abundant examples of diseases spread by this means. The convalescing patient is also a source of contagion in most cases, as the bacteria of infectious and contagious disease linger with or near the recovering patient, ready for a new subject. In fatal cases the contagion may be conveyed to the funeral attendants and visitors and multiply the disease and death. The ease or readiness with which every article that is used in the sick room, such as tableware, medical necessities, bed pans, etc., etc., may be disinfected without injury by formaldehyde gas, makes it the ideal disinfectant for home use. Not less notable is the fact that it will not injure or

change the most delicate tints of wall paper, drapery, painting, fresco work, nor blacken or tarnish metallic instruments or silverware.

IN PUBLIC OFFICES, HOTELS, ETC.

Equally important to the people is it that the sanitary condition of the home shall be extended to public offices, hotels and business houses.

Jails, prisons, station-houses and work-houses require frequent disinfection to preserve the health of inmates. Formaldehyde vapor is here the best antiseptic, inasmuch as it is a deodorant as well as a disinfectant, and sweetens the atmosphere while destroying the bacteria. If the atmosphere be impregnated with formaldehyde gas it will penetrate every crevice of floor, wall, ceiling or closet and destroy lurking disease germs. Its economy also fits it for a wholesale use in such places.

IN LIBRARIES, PUBLIC AND CIRCULATING.

Formaldehyde is the only practical disinfectant for books. Books of circulating libraries acquire all the disease bacteria that are present in the homes of the borrowers, since it is usual for patients to be provided with books from circulating libraries in order to pass away the hours of convalescence, time when disease breeding bacteria are still present. Perhaps the nurses or attendants of the sick are not less guilty of borrowing books while surrounded by the infectious or contagious atmosphere of the sick room. Many epidemics have been shown to have been promoted in this manner.

Mr. E. G. Horton, working in the Laboratory of Hygiene of the University of Pennsylvania, has written an interesting and instructive article on the disinfection of books by formaldehyde obtained by the evaporation of a concentrated solution. In the work several questions presented themselves which were essentially as follows: Under ordinary conditions can books be disinfected by formaldehyde? What is the smallest proportion of the vapor to the air which will effectively sterilize in a limited time—as twenty-four hours? What is the shortest exposure that will suffice? Is a decrease in the amount of the vapor present counter-balanced by an increase in the length of time of expose?

The main conclusions reached were to the effect that books could be disinfected in a closed space by formaldehyde. The

disinfection is rapid, when the atmosphere is rich in formaldehyde, the effect produced in the first fifteen minutes is practically equivalent to that observed after twenty-four hours. Prolongation in the time of exposure does not counter-balance a dilution of the formaldehyde. In cases where the disinfection had been incomplete, the vitality of the organisms had been so weakened that they survived, only if transferred in a few hours to media suitable for their development. The use of formaldehyde is not detrimental so far as observed in any manner to the books, nor is it objectionable to the operator beyond temporary irritation of the nose and eyes, somewhat similar to that produced by ammonia.

The frequency with which second and third cases of scarlet fever appear in houses that have been disinfected by the inspectors of sanitary authorities, says *The Lancet*, causes grave doubts as to the efficiency of the procedure usually adopted, despite its official sanction. Stripping the walls, lime washing walls and ceilings, and scrubbing woodwork and floor boards with soap and water are indeed effectual enough, and to these when thoroughly done we are disposed to ascribe any successful results rather than to the more technical process of so-called disinfection by sulphur fumes, which is little better than a superstitious rite or incantation shorn of the religious character it had in the mind of Ulysses when he "fumigated" the halls desecrated by the massacre of his wife's suitors after removing the corpses and washing away the blood with a promptness that precluded all thought of other than moral pollution. But in the light of bacteriological experiments dry sulphurous acid fumes, whether generated by burning sulphur or carbonic sulphide, or, as has of late become the fashion, by opening cylinders of the compressed gas, are for all practical purposes useless. The gas would act as a fairly powerful germicide on articles or fabrics previously saturated with water, but its bleaching action precludes its employment in this way with colored materials, carpets or curtains, and it is as what is called an "aërial disinfectant" that it holds its ground in popular esteem. But ærial disinfection is an absurdity; no one wants to purify the foul air, which is easily enough removed by simple ventilation. In disinfecting a room the true aim is to kill the germs contained in dust on ledges or in the crevices between the boards, or adhering to the walls and other surfaces, and the dry sulphurous gas is powerless for this work.

Sulphurous acid fumes as a disinfectant have undoubtedly proved a failure, but we can reach and sterilize concealed infectious matter in rooms only by means of a reliable gaseous germicide. This we have in formaldehyde, as the following reports will testify:

In *Hospital*, July 25th, Dr. H. W. Jones gives an account of some of the latest work done with formaldehyde as a disinfectant of rooms and hospital wards. The experiments of Drs. Roux and Trillat have shown that the dust on walls could be completely sterilized. As regards penetrating power, the results are no less conclusive. Thus Dr. Bosc of Montpelier found that staphylococci concealed in the pocket of a coat, and colon baccilli placed under a mattress folded on itself, were rendered absolutely sterile.

Roux and Trillat have discovered an ingenious method of testing this penetrating power. This action of formaldehyde on gelatin is to render it insoluble; to make use of this property as a test little cubes of glass are coated with liquefied gelatin. When the gelatin has set these are placed in various positions in the room which is being sterilized, and after the process is completed examined by immersion in boiling water. It is found that on those cubes which have been exposed to the action of formaldehyde the gelatin coating is insoluble.

Another test, used by the same observers, depends on the power which formaldehyde possesses of converting aniline reds into blues or violets. Bits of cloth dyed with fuchsin can be used in this way as tests, or a combination of this and the gelatin test can be used, the gelatin being dyed with fuchsin before the glass cubes are coated.

Roux and Trillat demonstrated that animals can live in an atmosphere that has been treated by formaldehyde vapor. This is done by washing first with a solution of ammonia and then with sulphuric acid. This treatment would have no chemic action on any oxides of carbon that might have been formed during the disinfecting process, so that it may be taken as proved that the process is unattended by any risk for the evolution of carbonic acid. There is yet another point which has been brought out by these experiments with formaldehyde. It has been proven by Pottevin and also by Roux and Trillat that *to obtain the best results a temperature of thirty-five degrees C. is necessary.* Still, it was found by actual experiments

in rooms that it is possible to completely sterilize walls, ceilings, floors, dust, air, and all contents at the ordinary temperature. There can be little doubt that from the point of view of preventive medicine this is one of the most important discoveries that has been made for many years.

Dr. J. Wortman, an eminent German bacteriologist, after a long series of carefully conducted experiments, reports as follows:

"It is evident, without further proof, that in formaldehyde we possess a substance that has a very deleterious effect upon vegetable life, and is therefore an antiseptic of first rank, which, almost equaling corrosive sublimate in its action, ought to supersede not only that but also carbolic acid."

He further recommends its liberal use in epidemic periods in the disinfection of closets, etc. Dr. Wortman's results are more than confirmed by the subsequent experiments of Dr. J. Stahl, whose work has the corroboration of Professor Cohn of Breslau.

Perhaps the most extended and thorough work with formaldehyde in this country has been done by Dr. J. J. Kinyuon of the United States Marine Hospital Service. We quote from his report as published in the public health reports of January, 1897:

"Bouillon cultures of the following organisms were spread on cover slips and allowed to dry, then exposed under a bell jar to a saturated atmosphere of formaldehyde, periods varying from one to sixty minutes. The slips were then planted into bouillon and kept at a temperature of thirty-seven degrees C. for twenty-four and forty-eight hours. In all instances mentioned "controls" demonstrated the vitality of the germs prior to exposure to the gas.

	ORGANISM.	TIME OF EXPOSURE.	AFTER 48 HOURS.
1.	Staph. pyogenes	All of 1 min. and over.	No growth.
2.	Spirillum Finkler	" 1 " "	" "
3.	Spirillum Cholera	" 2 " "	" "
4.	B. Coli. Com	" 5 " "	" "
5.	B. Typhoid	" 10 " "	" "
6.	B. Diphth	" 3 " "	" "
7.	B. Glanders	" 2 " "	" "
8.	Dip. Pneum. (partially dry)	" 2 " "	" "
9.	Dip. Pneum (dried)	" 1 " "	" "
10.	B Pyocyan	" 2 " "	" "
11.	B. Anthrac. (with spores)	" 2 " "	" "
12	B. of Bubonic Plague	" 1 " "	" "

Experiments in the disinfection of a room conducted in a ward of the new smallpox hospital of the District of Columbia by Dr. Kinyuon resulted as follows:

Room capacity, thirty-three hundred cubic feet; percentage of formaldehyde one; time twenty-two hours.

(*a.*) Cultures on Petri dishes, covered with filter paper, and enveloped in ten layers of blanket; anthrax, growth; diphtheria, no growth, S. pyogenes aureus, growth.

(*b.*) Cultures, spread on cover slips, placed in double envelope, the inner one sealed with paraffin, and enveloped in ten layers of blanket; anthrax, no growth; S. pyogenes aureus, growth.

(*c.*) Culture on Petri dishes, covered with filter paper, and wrapped in thirty-six layers of new cotton sheeting; anthrax, growth; diphtheria, no growth.

(*d.*) Cultures spread on cover slips, placed in double envelopes, the inner one sealed with paraffin, and enveloped in thirty-six layers of new cotton sheeting; anthrax, lost; diphtheria, no growth; S. pyogenes aureus, growth.

(*e.*) Cultures in double envelopes, the inner one sealed with paraffin and wrapped in folds of three sheets gathered into a bag; anthrax, no growth; typhoid, no growth; diphtheria, no growth; S. pyogenes aureus, no growth.

(*f.*) Cultures in Petri dishes, covered with filter paper and exposed on mantel in room; anthrax, no growth; diphtheria, no growth; typhoid, no growth.

(*g.*) Cultures spread on cover slips placed in double envelopes, the inner one sealed with paraffin, and exposed on mantel in room; anthrax, no growth; diphtheria, no growth; typhoid, no growth; S. pyogenes aureus, no growth.

(*h.*) Cultures spread on cover slips and placed in double envelopes, the inner one sealed with paraffin and exposed between the leaves of a closed book; anthrax, growth; diphtheria, no growth; S. pyogenes aureus, growth.

He characterizes the gas as a reliable disinfectant for curtains, clothing, carpets, bed clothing and surfaces generally. Complete success was achieved in many instances in sterilizing cultures of anthrax, diphtheria and typhoid when enveloped in ten layers of blankets or thirty-six layers of cotton sheeting.

The interiors of books were disinfected with some difficulty, as were the interiors of upholstered furniture, mattresses and pillows, though, as noted in his previous experiments, a comparatively small percentage of gas was employed.

He concludes that owing to the very volatile nature of formaldehyde, perfect and speedy disinfection can be secured only by stopping closely every possible means of escape to the outer air.

"Statements have been made," says Dr. Kinyuon, "that for room disinfection all that is required is to saturate clothes with formalin and hang them up in the room; allow the room to be closed for a given time, when it will be found to be disinfected.

"Our results do not confirm this.

"At this juncture it might be well to remark upon the effects of the formaldehyde gas and its solutions upon textile fabrics, hair, fur and leather. Experiments were made by subjecting samples of wool, cotton, fur, and leather goods of every description to crucial tests, using solutions of various strengths and a saturated atmosphere of the gas.

"The results obtained were in every way satisfactory. Of over two hundred and twenty-five different samples of wool, silk, cotton, linen, leather, and hair subjected, there was no change observed in textile character, even when they were soaked in a strong solution of the gas.

"*Effect on colors.*—Little if any change occurred in the colors of the fabrics; only three of the number showed any change. These were two shades of violet and one a light red. These were coal-tar colors, and were also quickly bleached by the sun.

"*Effect on metals.*—Iron and steel are attacked by the gas, and more so by its solutions. Copper, brass, nickel, zinc, and gilt work are not acted upon. The effect of the substance on iron should be borne in mind if iron disinfecting chambers are used for applying the gas. If this be the case, the surface of the interior of the chamber should be protected by paint or varnish.

"After subjecting textile fabrics to the action of the gas, there always remains a considerable quantity of the formaldehyde in combination with the materials, which is slowly given off for a considerable time thereafter. This is especially so in the case of mattresses and feather pillows.

"This is best obviated by subsequently exposing the article to the fumes of ammonia, which neutralizes the formaldehyde by converting it into a formamide—a rather stable body, possessing germicidal properties of no small value, and not prone to undergo decomposition."

PROFESSOR ROBINSON, ON FORMALDEHYDE.

At the meeting of the American Public Health Association, held at Buffalo, N. Y., October, 1896, Prof. F. C. Robinson, Professor of Chemistry at Bowdoin College, Brunswick, Me., presented an exhaustive paper giving the result of his experimentation with formaldehyde, with a lamp devised by himself, in which he cited among many others, an instance where a test upon a large scale was made, to-wit:

"We were asked to disinfect a house in Portland, Me., where there had been three cases of diphtheria, one fatal. The house was a large brick residence very well furnished, and most of the furniture in place. The different patients had been ill in different parts of the house, so that the whole place must have been more or less infected. The whole house, including the three floors and basement, was of about sixty-eight thousand cubic feet capacity. Two halls and stairs connected the three upper floors making two direct passages from top to bottom. The temperature was kept at about seventy degrees F. throughout the work. All the fireplaces were stopped with burlap or paper, but no other precautions were taken. Three generators were used, one of one quart, and two of two quarts capacity.

All three were placed in the basement, and that and the laundry first flooded with the gas. The generators were left near the doors. After the alcohol had evaporated, they were quickly removed and the doors were kept closed for at least four hours.

The rooms were all taken separately in this way throughout the house, one floor at a time, beginning with the basement. The generators were then placed in the halls, all the room doors being closed. The mattresses were left for the most part upon the beds. The closets and bureau drawers were opened, and the bric a-brac, books, and other things left as they were with a good chance for the gas to circulate about them. It took about twelve hours to go over the whole house and nine gallons of alcohol were used or about one quart to every two thousand cubic feet of space. Threads infected with diphtheria cultures were placed around in different parts of the worst rooms between sterilized blotters. Of the twelve cultures made from these, every one was sterile after incubation.

There can be no doubt that formaldehyde gas possesses the greatest of disinfecting properties. It has great possibilities of becoming a popular disinfecting agent. It has advantages above anything now in use for that purpose. It is comparatively cheap and with the new generator can be easily used by anyone of ordinary intelligence. It is not injurious to anything found in the most luxuriously furnished apartments. It leaves no disagreeable odors. If the windows are thrown open, in a short time no trace of the gas remains. In our experiments, all pathogenic germs were destroyed in three hours. But where the room is not needed for immediate use it would be well to leave it closed for twenty-four hours to make doubly certain under all conditions. The best and surest results are obtained with the rooms at ordinary living temperatures. Dampness is a disadvantage, as it absorbs more or less of the gas and holds the odor in the rooms. It can have no injurious effects upon persons occupying the house after disinfection, and the only inconvenience to those using the gas is a little

smarting of the mucous membranes of the eyes and nose which can be avoided by the use of a damp towel. Bedding should be hung upon lines or chairs and everything exposed as freely as possible to the action of the gas. At least one litre of alcohol should be used for every two thousand cubic feet of space, which would be about a quart for a room 15x13x16. With a little care and common sense, good results can be obtained.

At a meeting of the Maine Medical Association, June 3, 1897, Professor Robinson read a paper on "Disinfection," in which he reaffirmed his former opinion of formaldehyde as follows:

I shall limit my subject to what may be called space disinfection, or, as it commonly presents itself, the disinfection of rooms or houses. This is and has always been the most difficult kind of disinfection, and of course the most important. When the infectious material is in a vessel of small size it is a comparatively easy matter to destroy it. There are several cheap and effective substances which can be used with confidence. It is true that a better one than any of these would be hailed by sanitarians, but they are not suffering for it as long as they can get bichloride of mercury or bleaching powder. All health boards have formulas for making and using these. But in the case of rooms it is a different matter. The poisonous matter may be anywhere. It is not a question of a few drops of a disinfectant put here or there, but some put everywhere.

One is confronted also with the matter of destruction of materials in a room. A room may as well be stripped to its laths and replastered at once as to be treated with bichloride of mercury or bleaching powder in sufficient amount to properly disinfect it.

It was formerly thought that a strong smell of carbolic acid or camphor in such a room would be sufficient, but we now know that it is not. Recourse was then had to sulphur, and for the past ten years nothing satisfactory had been proposed as a substitute, until about a year ago we began to hear of a material called formaldehyde.

Sulphur, as you all know, is burned for such purpose, and the disinfecting material formed is sulphurous acid. The drawbacks to the use of sulphur have been the large amount necessary, the uncertainty of its action even then, and its destructive action by reason of formation of sulphuric acid. About ten years ago a committee of the American Public Health Association reported a qualified approval of its use, provided from six to eight pounds were burned in two thousand cubic feet of room space. Later experiments have thrown more doubt upon its efficiency. Foreign governments have gradually given it up. Such experimenters as Roux, Pasteur, Koch and many others abandoned it, and those who still cling to it do so for want of something to take its place. As one health officer put it, "fumigation of some kind is demanded, and sulphur fumigation is the only kind which does any good, and so we use it. It is an advantage to have people think we are doing something."

This was the condition of things when, about five years ago, articles appeared in the foreign journals describing the disinfecting properties of formaldehyde.

This compound was discovered in 1867, and has always been of special scientific interest, as being the simplest one of the aldehydes, and possibly

the starting point in nature for building up the carbohydrates. Its chemical formula is CH_2O and multiples of this give starch, grape sugar, cane sugar and all the carbohydrates.

For the first few years after the discovery of its antiseptic properties, the solution in water called formalin, formal, or formaldehyde, by various makers, was principally used, because of the difficulty of preparing the gas in sufficient quantity. But that difficulty was rapidly overcome and now it is possible to use the gas directly for house and room disinfection.

The gas shows its presence in a room by a sharp odor, and irritation of eyes and nose. It does not seem to be poisonous or injurious to colors or fabrics or metal work. As is the case with a new thing, great care must be used not to overestimate its power. There are already indications of this.

My experiments show that it must be strongly present in a room in order to be efficient. I do not regard it as safe to use less than one quart of wood alcohol to two thousand cubic feet of room space and prefer more than this rather than less. It unquestionably penetrates clothing better than sulphur fumes, but I cannot help thinking that the published cases of remarkable penetration are cases of faulty experimentation. I mean remarkable penetration with small amount of gas.

It must be remembered that experiments are made with dry cultures of bacteria as a rule, and drying is liable to kill them or very much weaken them. In our experiments we have had to constantly be on our guard against this. Then, again, cultures get weak by repeated cultivation, and more easily killed than fresh ones, such as would come from a virulent case of infectious disease. Wood alcohol is not very expensive and should be used freely. The tank of my common generator holds two and one-half quarts, and my general advice is to fill it nearly full, even for a small room.

Of course, it is necessary for the gas to be quite closely confined to the room in question. If there are very loose windows or fireplaces open, these should be closed, and the door into the room should not be opened after one has made sure that the generator is working well, that is, after the first fifteen minutes.

Bedding or clothing should be treated in as small a room as possible, they being spread out as widely as possible. Books and drawers should be opened.

If these directions are followed carefully, I believe that formaldehyde will prove a great help to the sanitarian.

I have been asked whether it destroys moths and other pests in furniture or beds. My answer is that I do not know, but am very doubtful about it. It is not a poison to life indiscriminately, but only to bacterial life. I should expect that it would destroy eggs and perhaps recently hatched individuals of the vermin class, but not the developed animal. Further experiments will be needed to determine this.

APPARATUS.

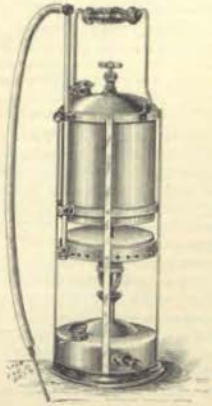
Since the discovery of formaldehyde inventive genius has striven to provide an apparatus for generating the gas that is efficient, durable, economical and adapted to the various needs required, especially local health boards.

SANITARY CONSTRUCTION COMPANY GENERATOR.

This apparatus consists of:

1. A closed receiver, preferably of copper.

2. A coil of copper pipe attached at one end to the bottom of the receiver (1), and at the other by means of a suitable connection with the room or apartment to be subjected to the germicidal action of the gas.



3. A valve to control the entrance of the coil (3) into the receiver.

4. A heating lamp.

MECHANICAL OPERATION.

A quantity of the solution of formaldehyde gas is placed in the receiver (1) and the receiver (1) is closed. The heating lamp (4) is lighted and the coil (2) is brought to a red heat. The valve (3) is then opened, and the formaldehyde solution contained in the receiver (1) is allowed to pass down and into the coil (2), which has been brought to a red heat, in a fine stream. Upon coming in contact with the heated metal the formaldehyde solution is instantly decomposed, and the liberated formaldehyde gas is further purified as it progresses through the incandescent coil tube (2) into the room or apartment to be subjected to the action of the gas.

CHEMICAL OPERATION.

Formic-aldehyde or formaldehyde CH_2O, the gaseous oxidation product of methyl alcohol, is a body extremely polymerisable; by the reunion of two of its molecules it forms a body known as para formaldehyde $CH_2\ O\text{-}CH_2O$. In this form it combines readily with water, giving a solution with a strength of forty per cent by weight of the gas. This is the formaldehyde solution of commerce. To prevent the precipitation of the para formaldehyde in this solution, methyl alcohol, in the proportion of at least ten per cent, is added.

This para formaldehyde $CH_2\ O\text{-}CH_2O$, stable in the solution at ordinary temperatures, can be broken up into its original $CH_2\ O$, or formaldehyde gas, and this formaldehyde gas can be liberated from the solution by the application of

heat. It would at first seem that it was only necessary to boil the solution in an open vessel, but in practice the operation presents many difficulties, for, after the boiling has proceeded for a few minutes, a second product of polymirization is formed, by the reunion of three molecules of formaldehyde, called trioxymethylene, a white semi-solid body containing in itself seventy per cent of formaldehyde, having very little germicidal power, and requiring a degree of heat much higher than that of the boiling point to break it up into the original CH_2O, or formaldehyde gas.

An attempt to remedy this difficulty resulted in the adoption of a closed autoclave, in which the formaldehyde solution was heated, and the resulting vapor confined until a pressure of at least two atmospheres with the corresponding temperature was attained.

This method was only partially successful, as it was not possible in practice to employ with the safety high pressures necessary to give the temperature required to completely break up the products of polymirization and resolve them into the original formaldehyde; and further, it was found that the ten per cent or more of methyl alcohol contained in the commercial solution of formaldehyde, united with an equal quantity of formaldehyde to form a product known as methelal, a body having no germicidal properties, and which reduced the quantity or volume of formaldehyde gas liberated from a given quantity of formaldehyde solution to a corresponding degree.

In the process herein described the pressure system is abandoned, and the degree of heat necessary to break up the polymerized products is supplied by means of an incandescent copper tube into which the formaldehyde solution is introduced in a fine stream, to be instantly vaporized as it comes in contact with the heated metal. As this vapor progresses onward through the tube it is thoroughly superheated, being brought to a temperature equal to at least one thousand degrees Fahrenheit, polymerized products are thoroughly broken up, and only the pure formaldehyde gas escapes.

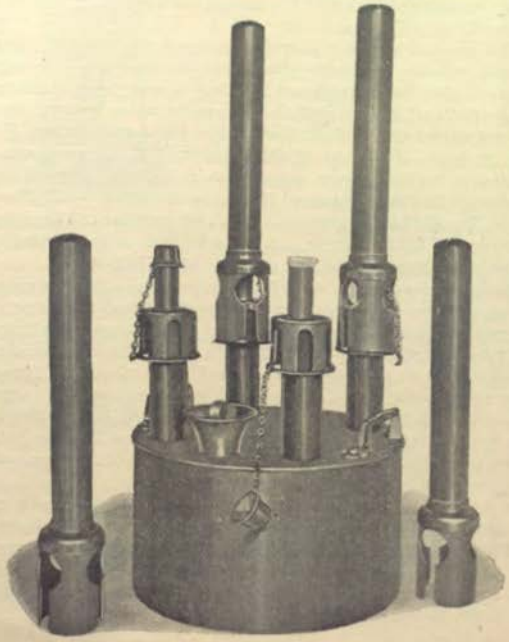
A further action of the intense heat in the copper tube on the solution is to convert the methyl alcohol contained in the solution, which would otherwise combine with an equal quantity of formaldehyde to form methelal, as previously described, into formaldehyde gas by partial oxidation, the action responding to the formula.

Methenane $H-C-H=CH^{1}$

Methyl alcohol $H-C-HO=CH^{2}OH$

Formic aldehyde $H-C-HO=CH^{2}O+H^{2}O$

THE MOFFATT FORMALDEHYDE GENERATOR.

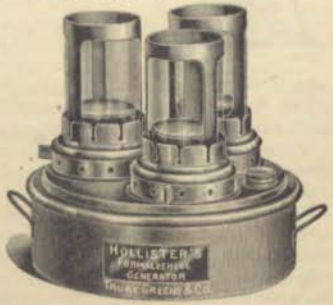


This apparatus produces formaldehyde vapor by the limited oxidation, that is, partial combustion of wood alcohol. The base is a receptacle into which the combustible material is put, and contains a wick to supply the alcohol to the upper part of the apparatus where it is subjected to limited oxidation. This upper part is a metallic contrivance consisting of a tube or chimney to promote the draft, and internal devices to regulate this draft. The formaldehyde vapor is thrown off from the top of this tube. The whole apparatus is adjusted when made so as to give the largest possible yield of formaldehyde. In operation the apparatus is self-regulating, and to be operated all that is necessary is to remove the upper part of the generator, light the wick and replace the upper part. The apparatus will then generate formaldehyde until the alcohol is exhausted. Since bacteria vary greatly in resistant power, and their destruction, to an extent, depends upon the character of room furnishings which may offer them degrees of protection, and again upon the ability to prevent a loss of gas through leakage of windows, doors, etc., no set rule can be laid down, but experiments of bacteriologists make it possible to accompany each instrument with instructions for successful disinfection.

The illustration represents size No. 3, suitable for health boards, small hospitals, and physicians.

THE HOLLISTER GENERATOR.

This apparatus consists of a metallic reservoir supplied with a wick which delivers the methylic vapor to the dome where it is mixed with the oxygen necessary for its perfect decomposition. The upper dome opening is fitted with a combination decomposing screen which, with the chimney, completes the apparatus.



No. 2.

Formaldehye and aqueous vapor are liberated according to the following equation:

$CH_4O+O=CH_2O+H_2O.$

There is no flame, hence is eliminated the possibility of fire, and the wasteful consumption of the fluid.

SCHERING'S FORMALIN DISINFECTANT AND DEODORIZING LAMP, AND FORMALIN DISINFECTANT.

FORMALIN LAMP.

FORMALIN DISINFECTOR.

With the Schering apparatus, the formalin is used in the shape of pastils (paraform), and can be used by any person. The pastils are vaporized by a new process, by which the formalin is given off in its gaseous and most active form. They contain one hundred per cent of pure formaldehyde. Thus a pastil weighing one gramme (15⅘ grains) develops one gramme (15⅘ grains) of pure formaldehyde gas, and therefore equals 2⅔ grammes (38⅘ grains) of the forty per cent fluid formalin. One gramme of pure formaldehyde gas as obtained by heating one pastil occupies a volume of seven hundred and forty-five ccm. (forty-five cubic inches).

The name "Formalin" has been given by the "Chemische Fabrik auf Actien, vormals E. Schering," in Berlin, Germany, to a forty per cent solution of chemically pure formaldehyde in water.

Formaldehyde (CH_2O), as is well known, is a gaseous body which is prepared by subjecting methyl alcohol to oxidation. It is readily absorbed by water; for this reason it is put on the market in the form of an aqueous solution termed "Formalin."

Formalin mixes with water in all proportions. It is, therefore, easy to prepare any dilution that is wanted.

Prof. K. B. Lehmann, of Würzburg (*Munchener Med. Wochenschrift*, 1893, page 597), after studying the properties and characters of formalin, recommended it as the best and safest, as well as the cheapest, preparation for disinfecting clothes, toilet articles and household goods, especially on account of the great extent to which it could be diluted and still preserve its activity.

The disinfectant lamp may be used in close living-rooms, especially such with damp walls; in sleeping rooms; sick rooms;

rooms where dead bodies have lain; in ships' cabins; in railway sleepers; in railway carriages and waiting rooms; in hotels and lodgings (important when traveling or in the country); in schools; in libraries; in business places; in restaurants; in privies (especially where there is no flow of water, or an insufficient one, as in small towns and in the country); in urinals, etc.

Also in meat markets, meat cellars; fish, game and poultry stores; slaughter-houses, pantries (especially in the country, where considerable quantities of meat, etc., must be kept for a varying time), milk cellars, etc.

The Formalin Disinfector is specially designed for disinfection on a large scale, for the complete disinfection and sterilization of large rooms, entire dwellings, and their contents; as also for the thorough disinfection of single rooms in cases where it is desirable to destroy the more resistant spores. It is constructed upon the same principle as the lamp.

These lamps are not cumbersome, and are easily handled. The small one can be carried in the pocket.

DR. KINYOUN'S FORMALDEHYDE LAMP.

Dr. Kinyoun's lamp consists of three parts; a lamp bowl, a collar containing converter, and a hood, and is constructed after the following manner:

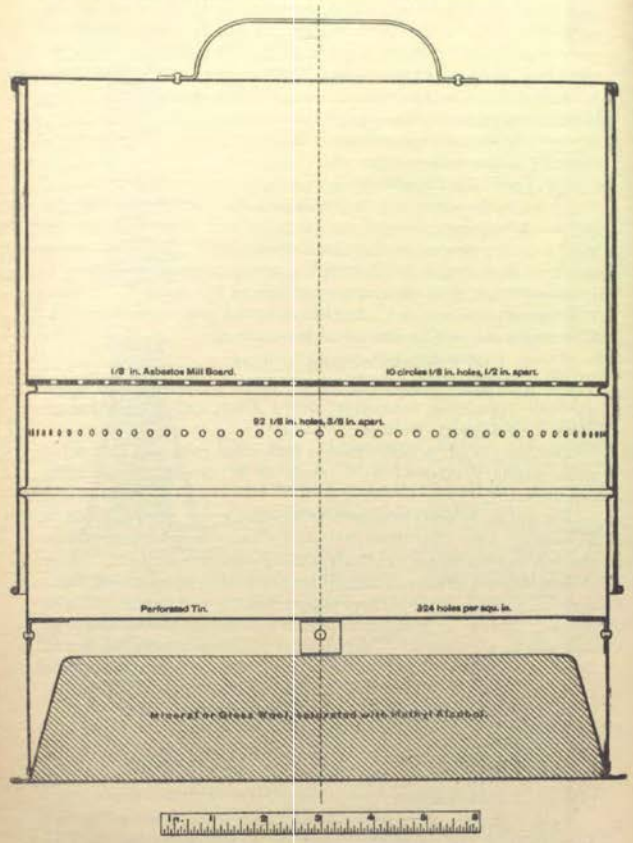
The lamp bowl is made from a five-quart milk pan and filled with ordinary mineral wool, such as is used for insulating pipe, etc.

The collar is made of sheet iron; the lower edge is made to fit closely over the shoulder of the lamp bowl eight inches above a number of perforations (ninety-two) for draught. Nine inches above a groove is turned on the collar, upon which lies a disk of platinized asbestos, supported by a number of cross wires. The collar is extended about five inches above this disk and acts as a chimney. Just about a half-inch above the top of the lamp bowl is inserted a disk of perforated tin. This acts as a damper or radiator and prevents the undue volatilization of the alcohol by heat from the asbestos disk.

A hood is also provided which fits closely over the top and extending down below the draft holes. The efficiency of the lamp lies altogether in the character and construction of the platinized asbestos disk.

This is made of an extra hard pressed asbestos millboard ⅛-inch thick, and is perforated with ½-inch holes one-half an inch apart.

The best asbestos for this purpose is furnished by the H. W. Zahn's Manufacturing Company, of New York.



Formaldehyde lamp. Cross section.

Platinizing the disk—About $\frac{2}{3}$ gram of platinic chloride is dissolved in one hundred and fifty centimeters of alcohol or water. The disk is placed in a flat-bottomed vessel and the solution is then poured over it and allowed to thoroughly saturate it, after which it is placed in the iron collar and moulded in place. It is then ignited and the alcohol burned off. The perforated tin disk is removed and the collar placed over the lamp in the same position as if for heating it for disinfection. The alcohol is ignited and allowed to burn until the platinic chloride is converted into platinum black. It is then ready for use.

When the lamp is to be used the collar is removed and the required amount of alcohol is poured over the mineral wool; this readily absorbs the alcohol and prevents any free alcohol from spilling, should it be tipped over. It also prevents undue action of the flame should, by chance, it become ignited.

The collar is replaced over the lamp bowl so that one edge of the collar rests on the top of the lamp and a half an inch or so of air space is around the bottom. The hood is removed and the alcohol lighted. The lamp is allowed to burn freely until the platinized disk of asbestos begins to glow slightly, when the hood is placed over the collar slowly and then by means of the handle the collar is placed in proper position over the lamp bowl and pressed down so that the collar fits snugly.

After about thirty seconds remove the hood and observe whether the alcohol has ceased to burn. If not, replace the hood and again after thirty seconds remove, when the platinized disk should begin to glow and formaldehyde be given off. Sometimes, however, the lamp will ignite below at the draught holes and burn with a slight flame. This is caused by one of two things. First, the collar may not fit snugly around the lamp bowl; second, the perforated tin disk may have been heated too hot when the lamp was started. By placing the hood over the collar and waiting for about a minute this latter will be prevented.

It is intended that this lamp should be filled with the required amount of alcohol, placed in the apartment, started and allowed to remain for the full time of exposure. The air of the apartment can be neutralized by ammonia fumes and then opened. The results obtained by this lamp have been quite satisfactory, especially with regard to disinfecting apartments infected with diphtheria.

In concluding the description of his lamp, the doctor says he was not able at all times to disinfect the interior of pillows and mattresses with certainty, even when a very small room was used for this purpose and a large amount of methyl alcohol consumed. The surfaces, dust, etc., were every time rendered sterile.

QUANTITY OF ALCOHOL REQUIRED.

Not less than five hundred centimeters of methyl alcohol should be used for each one thousand cubic feet of space.

For disinfecting clothing and the light fabrics it would be well to put them in as small a space as possible and have the articles so arranged as to have all the surfaces freely exposed to the gas.

It is often required that a preliminary disinfection be given an infected apartment and contents before they are disturbed. This is, of course, a preliminary precaution which will, if properly performed, render the danger of dissemination of the infection less by sterilizing the surfaces of the articles. Lamps could be used advantageously in such instances for the preliminary disinfection of the surfaces of such articles which it would be necessary to remove and treat by other processes. When this is done the gas should be neutralized.

NEUTRALIZATION OF THE EXCESS OF FORMALDEHYDE GAS.

This is best accomplished by having a small tinned iron boiler, conical in shape, holding about three quarts, provided with a filling cock and tube on top. A rubber tube can be attached to this and fed into the apartment, through the door, preferably the keyhole. Ammonia water is poured into the boiler, stopcock closed, and then the boiler set in a bowl of boiling water. This will readily evolve the ammonia gas. A small kerosene lamp can be used instead of the boiling water.

In the Year Book of the Bureau of Animal Industry for 1896 is given the result of an extended series of investigations as follows:

"1. Formalin in concentration, $_{10000}$, makes the growth of tuberculosis, anthrax, cholera, typhus, pus, and diphtheria germs impossible.

"2. In gaseous form a weak dilution is sufficient to check growth.

"3. A one per cent solution will kill pathogenic organisms in an hour.

"4. With a three per cent solution and the final use of alcohol it is possible to make the hands germ-free. Whether the skin of the hands is attacked by this method remains to be proved.

"5. Spraying with a formalin solution and subsequent inclosure of the articles in a closed space will easily sterilize them.

"6. Uniforms, etc., can be disinfected on a large scale without injury, twenty-four hours being required.

"7. Fæces are deodorized by a one per cent s lution, and are in thirteen minutes germ-free; and buildings can be easily disinfected by a one per cent to a 1¼ per cent volume of the gas.

"8. Formalin is a useful preservative.

"As compared with other disinfectants, such as corrosive sublimate, carbolic acid, etc., formaldehyde and its solutions have the advantage of not being retarded in their action by albuminoid matter, and of not injuring the articles to which they are applied. Their use, therefore, seems to be well recommended, and to fill many requirements which are not now fully met by other disinfectants. Especially is this the case in disinfecting rooms, clothing, bedding, railroad cars, etc.

"Experiments made by Roux, Trillat, and others upon the use of formaldehyde vapor for disinfecting rooms have been very satisfactory, in that the bacilli of anthrax, tuberculosis, and diphtheria have been killed within five hours by a saturated atmosphere of formaldehyde gas. After two days of thorough ventilation no odor remained in the room, nor were the objects which had been exposed to the action of the gas in any way injured. An objection to the use of formaldehyde has been raised because it adheres somewhat tenaciously to clothing and upholstered materials and the odor dissipates slowly. This, however, can be removed by thorough ventilation or by the use of a dilute solution of ammonia, which readily absorbs the gas. Placed in a room where formalin has been used as a disinfectant, this would cause a more rapid dissipation of the odor and would not injure the materials. It would seem that in formalin we have at hand the most useful disinfectant yet known, the application of which is a mere detail to be easily worked out in practice.

"It also appears to be useful as a means of preserving food, milk, etc. Its effect upon the digestive ferments has not been thoroughly studied, but the quantity used for preserving milk, one part to ten thousand, should be too small to give rise to any bad result, and none has been noted in practical use. Its

influence in this connection should be carefully studied before it is generally recommended.

"While testing the action of this gas upon the cattle tick recently, its action upon the respiratory organs of cattle was noted. A calf was kept for five hours in an atmosphere containing about two per cent of formaldehyde gas. During this time there was a slight watering from the eyes, and it coughed occasionally, but it did not seem to be in any special distress, and as soon as it was brought into the fresh air again it was all right and showed no bad after effects. This fact may prove of importance in disinfecting stables and the like.

"Another direction in which formaldehyde promises to be of practical importance is in the disinfection of imported hides, which may carry contagion, especially anthrax. The rapid action and penetrating power of this gas bids fair to overcome the practical difficulties hitherto attending the use of disinfectants for this purpose.

"Experiments have shown that very much less than one per cent by volume of the gas is destructive to injurious bacteria; but an atmosphere containing one to 1½ per cent by volume will give satisfactory results in six to thirteen hours in all cases. When the volume of the gas is increased the length of time necessary for the disinfection is considerably decreased."

An experiment has recently been made by a medical authority in the disinfecting powers of the vapor of formalin on library books. His conclusions are as follows:

1. Books can be disinfected in a closed space, simply by vapor of commercial formalin, by using one c.c. of formalin to three hundred c.c. or less of air.

2. The vapor of formalin is rapid in its disinfectant action. The effect produced in the first fifteen minutes is practically equivalent to that observed after twenty-four hours.

3. An increase in the amount of air to each c.c. of formalin is not counterbalanced by an increase in the length of time of exposure.

4. In case the disinfection has been incomplete the vitality of the organisms has been so weakened that they survive only if transferred in a few hours to media suitable for their development.

5. The use of the vapor of formalin is not detrimental, as far as observed, in any manner to the books, nor is it objectionable to the operator beyond a temporary irritation of the nose and eyes, somewhat similar to that produced by ammonia.

All the generators illustrated herewith were furnished Dr. Eli Grimes, Bacteriologist of the Iowa State Board of Health, for experimentation. The following is his report thereon:

DR. GRIMES' EXPERIMENTAL DISINFECTION WITH FORMALDEHYDE.

Formaldehyde is now so well known that it needs no introduction. The experiments of which the following is a brief report, were undertaken to determine the efficiency of this gas as a disinfectant and to ascertain the relative merits of the various forms of apparatus used in producing it for sanitary purposes. The tests were made, not in a laboratory, but in sleeping rooms with rugs, carpets, furniture and bedding in place, while all the conditions were made as nearly as possible like those of actual infection.

The infectious material consisted of growing and dry cultures of various pathogenic bacteria, tubercular sputum, fecal matter, pus, infected cloth, cotton, and threads prepared by soaking them in bouillon cultures and drying.

The bacteria used were those of anthrax, tuberculosis, pus, typhoid fever, cholera, bubonic pest and diphtheria.

The infectious material before mentioned was distributed throughout the room, beneath the rugs, under blankets, in mattresses and pillows, in crevices of the wall paper, freely exposed on tables, mixed with dust on shelves, and enclosed in books. After the apparatus was put in action the room was tightly closed and not disturbed till the expiration of the time that the experiment was to cover.

There are three methods of obtaining formaldehyde gas for disinfection. The one in most common use is that of generating it from wood alcohol by incomplete combustion. Another is to heat the solid or polymerized formaldehyde in the vapors of burning alcohol thus producing the gas. The third method consists in obtaining the gas from the commercial solution, formaline.

HOLLISTER'S DISINFECTING LAMP.

This is an apparatus that evolves formaldehyde from wood alcohol, the essential part being a platinum gauze which is kept heated by the alcohol vapor, thus effecting partial combustion.

TABLE OF RESULTS.

Capacity of room, 2,000 cubic feet.

	5 hrs.	10 hrs.	20 hrs.
Tuberculosis	v*	v	v
Pyogenes aureus	v	v	v
Typhoid	v	v	v
Cholera	v	v	Killed
Bubonic pest	v	v	Killed
Diphtheria	v	v	Killed

THE MOFFATT GENERATOR.

This uses wood alcohol, part of which is completely burned by means of an ordinary wick; this heats metal tubes through which the alcohol vapor is passed, mixed with a limited amount of air, thus producing formaldehyde.

* v indicates that organisms were still virulent.

One tube burner gave the following results:

	5 hrs.	10 hrs.	20 hrs.
Tuberculosis	v	v	v
Pyogenes aureus	v	v	v
Typhoid	v	v	v
Cholera	v	v	Killed
Pest	v	v	Killed
Bubonic	v	v	Killed
Diphtheria	v	v	Killed

FOUR-TUBE BURNER.

Tuberculosis	v	v	Killed
Pyogenes aureus	v	v	Killed
Typhoid	v	Killed	Killed
Cholera	v	Killed	Killed
Pest	v	Killed	Killed
Bubonic	v	Killed	Killed
Diphtheria	v	Killed	Killed

SCHERING AND GLATZ'S APPARATUS.

The apparatus put on the market by Schering and Glotz is designed to volatilize paraform in the vapors of burning alcohol. By this means the solid form is converted into a gaseous form, sublimation being prevented to a great extent by the vapors of the burning alcohol.

The following results were obtained:

	5 hrs.	10 hrs	20 hrs
Tuberculosis	v	Killed	Killed
Pyogenes aureus	v	Killed	Killed
Typhoid	v	Killed	Killed
Cholera	v	Killed	Killed
Pest	Killed	Killed	Killed
Bubonic	Killed	Killed	Killed
Diphtheria	Killed	Killed	Killed

An attempt was made to use formalin, the forty per cent watery solution of the gas, as a room disinfectant. Formaldehyde forms with water a hydrate which is less penetrating and not so strongly antiseptic as the anhydrous gas. By heating the watery solution formaldehyde is not liberated but is vaporized as a hydrate, or becomes polymerized and is sublimed. The results obtained by evaporating formalin were in nearly every instance negative. In one series of tests an amount of formalin was used sufficient to give thirty cubic feet of gas or one per cent by volume of the contained air of the room. The liquid was allowed to escape from a stopcock and fall, drop by drop, into a dish kept heated by an alcohol lamp. The following results were obtained:

	5 hrs.	10 hrs.	20 hrs.
Tuberculosis	v	v	v
Pyogenes aureus	v	v	v
Typhoid	v	v	v
Cholera	v	v	v
Pest	v	v	Killed
Bubonic	v	v	Killed
Diphtheria	v	Killed	Killed

There are various forms of apparatus designed to use formalin to produce the gas. The one tested was that of the Sanitary Construction Company of New York. The principle involved is that of dehydrating the aldehyde with heat Formalin is heated in a retort and the vapor allowed to pass through a coil of metal tube kept at a bright red heat.

The following results were obtained by using an amount of formalin sufficient to give twenty cubic feet of gas, capacity of room two thousand cubic feet:

	5 hrs.	10 hrs.	20 hrs.
Tuberculosis	v	v	Killed
Pyogenes aureus	v	v	Killed
Typhoid	v	v	Killed
Cholera	v	Killed	Killed
Pest	v	Killed	Killed
Bubonic	v	Killed	Killed
Diphtheria	v	Killed	Killed

Prof. S. R. Macy, chemist of the Board, has suggested a very practical method that renders formalin of value in disinfection without the use of apparatus. The formalin is allowed to flow slowly over fresh unslacked lime. The water combines chemically with the lime, producing a sufficient amount of heat to prevent polymerization of the aldehyde. Much work yet remains to be done in establishing the efficiency of this method, but as far as tested it is equal to any now in use. In twenty hours tuberculosis, typhoid, pest, cholera and diphtheria were killed in every instance. The amount used being, as in the other tests, sufficient to produce a volume of gas equal to one per cent of the contained air in the room.

It will not be profitable to tabulate the results of other experiments. The conclusions can be briefly summarized as follows:

To disinfect a room a volume of aldehyde gas equal to one per cent of the room space must be liberated in a short time, in a dry condition, and allowed to act at least twenty hours.

Books cannot be disinfected by this amount and time except superficially. In the tables given in this report books were not considered. Infectious material spread on the leaves of books, or on paper and placed in closed books was found to be virulent at the end of the twenty-hours test in most instances.

Spores withstood the aldehyde in the majority of tests. Anthrax bacilli were used in all the experiments, but it was found that a greater amount of gas and a longer time were required to kill them than were employed in obtaining the tabulated results just given.

Pet animals often spread disease by carrying the germs in their fur. Cats, the fur of which was infected with diphtheria and typhoid germs were exposed in a room to the action of the aldehyde gas. In twenty hours their fur was found to be sterile, while from the animals used as a control pure cultures of both germs were obtained. The animals were not injured by the action of the gas. When an animal presents the lesions of the disease, as cats with diphtheria, disinfection cannot be applied.

Formaldehyde is a powerful deodorant. In some practical tests of this property it was found that the amount required to deodorize a room had to be increased one hundred fold in order to disinfect it.

Three conditions must be considered when using this agent for disinfection. They are, amount used, time allowed to act, and presence of moisture. Moisture inhibits its action.

Diphtheria bacilli are killed by an amount much less than is required to kill other pathogenic bacteria.

In selecting an apparatus for disinfection it must be remembered that many of the "disinfectors" on the market are not only too small but are not constant enough in their action to give reliable results. The ideal disinfector is one which liberates a known amount of the aldehyde. In practical use the only means of knowing whether or not disinfection has been complete is to know the amount of gas actually liberated.

We are indebted to Dr. W. L. Bierring, professor of bacteriology in the State University, for kindly supplying the original stock of pure cultures of the pathogenic bacteria used in carrying on this work.

PROF. MACY'S METHOD OF GENERATING FORMALDEHYDE GAS.

When Dr. Eli Grimes, the Bacteriologist, and Prof. S. R. Macy, Chemist of the Board were experimenting with the various generators so kindly furnished by their makers, for generating formaldehyde gas, Professor Macy demonstrated a new, simple and apparently less expensive method of generating the gas, and applying it, than any yet presented to the Board. He describes it as follows:

All aldehydes have the property of combining with other substances, such as water, ammonia and nitrogenous compounds. In this property of formaldehyde lies its power as a disinfectant and deodorant. It is therefore very necessary to have an anhydrous aldehyde, that it may combine and thus disinfect and deodorize. This is impossible whenever the aldehyde comes in contact with moisture before it reaches the subject to be acted upon.

In all methods, save one, for the preparation of formaldehyde, water is to a greater or less extent evolved with the aldehyde, thus giving the opportunity for combination, resulting in the formation of a hydrate.

With a desire to overcome this difficulty I have begun a series of investigations, expecting to be able to retain the water in chemical combination and allow the formaldehyde to be evolved in the form of an anhydrous gas. I will describe briefly the process resulting from my investigation.

It is well known that lime (calcium oxide) unites with water, forming a hydrate and evolving great heat. This property enables us to produce formaldehyde gas quite free from water. The lime should be in one lump, with a cavity to receive the forty per cent solution of formaldehyde, which is allowed to flow at the rate of fifteen (15) to any number of drops per minute, depending upon the number of cubic feet of space to be disinfected. The forty per cent solution of formaldehyde may be placed in a bottle, and a syphon terminating in a glass tube, with an opening the proper size to control the flow.

After the solution has been dropping on the unslacked lime for some minutes much heat is produced by the union of the water with the lime, and the aldehyde is evolved in a dry state, which is most efficient as a disinfectant.

We do not claim that all of the aldehyde in a forty per cent solution is evolved in a dry state, but we know from our results that we get a greater yield than from any other process using the forty per cent solution, or methyl alcohol. The lime must be solid, and free from air-slacked lime. For every pint of forty per cent solution of formaldehyde, use 3½ pounds of lime.

The investigations are to be continued and exact results given to the public.

AS A PRESERVATIVE.

In the United States Consular Reports, October, 1894, Vol. XLVI, No. 169, Mr. Louis Stern, Commercial Agent at Bamberg, says, concerning formalin:

"The technical journal issued by the Bavarian Polytechnic Society which is reputed to be the best of its kind in the kingdom of Bavaria, says formalin has demonstrated itself to be a perfectly harmless means for disinfecting purposes; for preventing and destroying the growth of bacilli. Its fumes are hurtful only when inhaled in considerable quantities.

It saturates animal tissues very rapidly and prevents their decay.

Meat, game, fowls, fish, etc., if dipped into a solution of formalin, remain fresh for a long period without getting a disagreeable taste or the odor of decay. Meat in which the process of disintegration has already begun, and which is in the first stages of decay, can be rendered odorless by simply dipping it into the solution for one or two minutes and washing with the same. The cause of the disagreeable odor is removed.

Regarding the use of formalin in the preparation of butter and cheese, sufficient data, the journal says, have not as yet been secured; but it has been shown to be very well adapted for cleaning the vessels and machinery employed in dairies.

Formalin is of special importance for slaughter-houses and meat-shops, for preserving fish and fruit during transportation. These must be dipped or placed for a short time in a weak solution of the chemical."

W. P. Hohenschuh, of Iowa City, chairman of the executive committee of the National Funeral Directors' Association, reported to the State Board a case coming under his care, of a woman weighing over two hundred pounds. She died February 9th. A fluid containing no metalic salts, and but seven per cent of formaldehyde, was injected into the body. It was kept in a warm room eight months. At the end of ten weeks the color and features were perfect, and at the expiration of eight months it was drying on the surface; the tissues were firm, and there was no odor from it at any time.

VETERINARY SCIENCE AND ITS RELATION TO THE PUBLIC HEALTH *

Mr. President and Gentlemen of the Iowa State Veterinary Medical Association:

Your Secretary in asking me to present at this meeting a brief paper for your consideration, was kind enough to suggest the topic which I have selected—"Veterinary Science and its Relation to the Public Health."

My subject therefore naturally resolves itself into two general divisions.

1. Veterinary science.
2. Its relation to the public health.

It is but a comparatively few years since veterinary medicine has been lifted from a basal position among the professions—from the domain of rank empiricism to the honored and dignified position of a science—a noble, beneficent and liberal, if not literally humanitarian, science.

The whole world of science owes a debt of gratitude to Chauveau, Wesley Mills, Fleming, Liautard and a score of others because of their earnest, well directed and efficient work in the field of comparative anatomy and physiology.

Forty years ago, when I studied medicine and attended medical lectures at the Jefferson Medical College in Philadelphia and at the University of New York City, there was no instruction whatever in our text-books, or in the lectures delivered by the ablest teachers of the country upon these branches. The educated physician of that day knew little more about comparative anatomy and physiology than the uneducated "horse doctor" of to-day, or at least was not required to know more.

The whole science of medicine and surgery, whether applied to man or beast, is almost being revolutionized—and largely by experiments upon the lower animals. Every advance in

*By J. F. Kennedy, A. M., M. D., Secretary Iowa State Board of Health, Des Moines, Iowa. A paper read before the Iowa State Veterinary Medical Association. Reprinted from the *American Veterinary Review*.

preventive and restorative medicine is a benefit to both man and beast.

Prof. Wesley Mills, the able lecturer on physiology in the faculty of human medicine and in the faculty of comparative medicine of McGill University, Montreal, Canada, in an address to the graduates of the veterinary department of the university in May last, said beautifully and truthfully:

"Medicine is, as applied to man, no longer a system of blind empiricism, nor, as applied to the lower animals, a combination of that with farriery. The barber surgeon and the farrier are but landmarks in the history of the evolution of medicine. Gentlemen, there is but one animal kingdom, governed by the same natural laws, applicable alike to man and his fellow creatures, lower in some respects, in the scale, but sharing with him the liability to disease and death.

"Comparative medicine is the medicine of the future, and the sooner that is realized the better for man as well as beast. Indeed, we now grasp the future—the present touches its skirts. Specialism, or division of labor, will be necessary, because the powers of individuals are limited. Some will elect to treat the lower animals, and some mankind, with even further subdivision; but there is only one science and art of medicine; and all the various bodies of workers in this vast field should form but different battalions of one great army fighting for the prolongation of vigorous life and the mitigation of pain in every quarter to which the power of medicine can reach."

Medical men and teachers in our medical colleges are everywhere coming to realize these facts. The veterinarian of to-day, who has been properly educated, goes out from his college qualified not only to practice his profession, but to enter the best medical colleges in the land with advanced standing.

How changed the relation of the educated veterinary surgeon of to-day! The time was when, within my own memory, he was assigned a secondary or inferior place when compared with the human physician or with those of the other learned professions, but now the well-equipped D. V. M., everything else being equal, takes his place in the scientific, social, moral and commercial world along with the ablest jurists, physicians, clergymen and educators!

It seems to me from a diagnostic standpoint the veterinary practitioner should be even better equipped than the physician. The latter is greatly aided in his efforts to arrive at a proper

diagnosis of the disease of his subject because of his ability to speak and to understand language. The subject of the veterinary surgeon, on the other hand, is mute. The character of the disease, its location and progress can only be learned by a sign-and-symptomatic language only acquired by patient study, thorough acquaintance with the anatomy, physiology and pathology of the animal, and by clinical observation; and these same qualifications must be adapted to the horse, cow, sheep, poultry, etc., as individuals differing greatly. Hence, though he may not be able to speak the language of the domestic animals, he must be able to readily understand their speech as voiced by their physical condition. Another reason why the veterinary surgeon should be thoroughly competent is that his subjects have no choice. They are entirely subject to the choice of their owners, who may from ignorance, prejudice, or mistaken economy select some one, if there are any such, who don't know the difference, anatomically, between a horse and a chicken, much less between a cow and a hog, and whose treatment is about as scientific. For this reason and because of the vast sums of money represented by the domestic animals of Iowa, the highest possible qualifications should be required of those who enter upon this practice.

It seems to me a burning shame that in this intelligent State of Iowa, and in this enlightened day, any man without any knowledge whatever of veterinary science, without knowing even the A, B, C of the anatomy of domestic animals, can swing to the breeze his sign as "veterinary surgeon;" and there is no law to inquire into his qualifications, and no power to regulate his practice.

The man or woman who teaches the farmer's children; the man who insures his property against fire and tornado, or his person against death or accident; the railroad corporation that hauls his produce to market; the bank in which he deposits his money; the dentist who pulls his teeth; the physician who treats himself and family, and druggist who compounds his medicine are all subject to statutory provisions, but when sickness and plague attack his flocks and herds and threaten their destruction, and endanger even the lives of his family, the law reaches out no guiding hand. The unprincipled and ignorant charlatan has an unchallenged standing before the law and often by his brazen effrontery and "stud-horse" advertisement enjoys a more generous patronage than his educated, competent and honorable rival.

It seems to me, therefore, that one thing the people of Iowa need is protection—legal protection against this dishonorable and dangerous class of pretenders, and you will pardon me gentlemen, if I suggest that it has seemed to me that you have been somewhat disposed to waste a good deal of ammunition in criticising some of your own advanced methods of experimentation, diagnosis and treatment rather than in closing up your ranks and making the united effort you should to secure the standing before the law you are so justly entitled to.

But enough on this point. Your "Relation to the Public Health" is a most important one, and is so far recognized by the State as to provide for the appointment of a State Veterinary Surgeon, and to make him a member ex-officio of the State Board of Health.

The State Board of Health and the Dairy Commission have large claims upon you. I hope the time will soon come when the latter, if it does not have it now, will have ample authority and financial aid to enable him not only to determine the butter fat in a given quantity of milk, for commercial purposes, but the sanitary quality of the milk, butter and cheese. I would go much further. I would not limit his function to the dairy, but I would make him a dairy and food commissioner, with adequate legal and financial backing to do thorough work. However, to do his present duty—to insure a wholesome quality of milk, butter and cheese, he must depend very largely, if not almost wholly, upon you. There must be inspection of the herds from time to time, as to their freedom from tuberculosis and other infectious and communicable diseases. Their food and drink, the condition of their stables, the methods of milking and of taking care of and marketing milk. In fact, all the sanitary or unsanitary environments must be known. The intelligent veterinarian is the only person from whom we would expect to get this information.

The State Board of Health and its auxiliaries, the local boards, are under the law charged with supervising and protecting the lives and health of the people; and as there are so many of the infectious diseases of animals that are communicable to man, you will readily see the great interest these boards have in your profession and work.

It is not necessary to take the time even to name the various diseases of domestic animals that are common, or at least communicable to man. You are perfectly cognizant of them.

Because their presence in the animal is a constant menace to the public health, the State Board of Health depends upon your profession largely for protection.

It is the proper function and duty of your profession to insure to the people of the State as early a recognition of, and as effectual protection against, the invasion and spread of these diseases as possible.

A great deal of distraction, demoralization and damage have arisen from the attempts to prove how extensively an animal may be diseased to render it unfit for human or animal food, especially in regard to such diseases as tuberculosis and actinomycosis and their ability to render meat and milk from animals so diseased dangerous.

I think there has been, in settling these questions, too much deference paid to those short-sighted breeders and stockmen who care but little what the ultimate results are so long as they can line their pockets.

Let me read to you what an able, honored and fearless member of your profession said in an address, as retiring president last June—I mean Dr. Harbaugh, of the Virginia State Veterinary Medical Association:

"We have," he says, "to fight a monster which stretches forth its arms in all directions and clutches with its grasp all who can be controlled by fear, favor or value received; and this monster is the wealthy breeding interest which makes a hobby of high-priced pedigreed cattle until it tires of them and then unloads them on the unsuspecting dairyman to infect his smaller herd with tuberculosis. Even from our standpoint there are two sides to this tuberculosis question. The first is the public health, and I care not whether a man believes there is much or little danger in using the milk or flesh of tubercular animals through risk of transmission of the disease to the human being, it is certain that such milk and flesh ought not to be used. Milk is a part of the cow, and therefore animal matter, and if the cow is tuberculous her milk is part of a diseased cow, and should not be used for human food. The same proposition applies to meats from tuberculous animals, no matter how thoroughly sterilized, and it disgusts me to hear our would-be veterinary politicians talk of using such meats the same as they do for the lower classes of Europe, when we have meat to spare for the world. No, gentlemen, we are not in Europe,

and do not have to devour diseased products to prevent starvation. Let us be consistent, and fight against all diseased animal products being used for human food.

"Another thing that surprises me is that there are veterinarians occupying high places who have the effrontery to tell us milk from tuberculous herds, when fed to pigs, produces the same disease in them, and that there is little danger of producing it in human beings!

"These are breeders' opinions, whether uttered by veterinarians, agricultural journals or other hirelings. No man who sees the post-mortem lesions of a few tuberculous cows wants milk from any such animals in his house, danger or no danger."

I like Dr. Harbaugh for his sensible views, so fearlessly and forcefully expressed.

The farmers of this State, especially the hog raisers, are appealing to you to protect their swine against the ravages of that fearful disease, hog cholera, that often in a few days sweeps as with the "besom of destruction" not only their hope of added wealth, but often the only means of retaining their homes.

There is one line of investigation and experimentation in connection with this particular disease that I wish to specially emphasize—I mean the great similarity, if not identity, of hog cholera and typhoid fever as it is manifested in the human subject.

Our honored State Veterinary Surgeon, Dr. Gibson, at a late meeting of the State Board of Health, read a most interesting report prepared by Dr. W. T. Wright, of Vail, Crawford county, detailing an outbreak of typhoid fever in a farmer's family near Vail. The father and four daughters, who lived at home, and another daughter who was visiting in the family, were all taken with typhoid fever—only two of the family, the mother and a young son, escaping. The father died—all the others, after a lingering illness, recovered. The well that supplied the family, as well as the stock, with water was situated in the lowest portion of the hog lot. The father and five daughters who were attacked with the disease used freely of this water. The mother and son, who did not use it at all, escaped. Previous to this outbreak of typhoid fever the hogs kept in this lot had had hog cholera in a severe and fatal form. Dr. Wright was led to examine carefully the symptoms present in the hog cholera cases and was struck with the marked similarity between the

symptoms of these typhoid fever patients and the cases of hog cholera, and was driven to the conclusion that there was much kinship, if not identity, between the two diseases.

It seems to me that it would be well for the bacteriologists of the State, physicians and veterinarians to thoroughly test this matter. The presence of typhoid bacillus or one akin to it should, if present, be readily detected in the excreta of the hog during such an attack. Should such identity be established, it would not be hard to adopt more rational methods of prevention and cure. But I cannot particularize any further. If the compliment of an invitation to prepare this paper has emboldened me to proffer advice, to call attention to matters outside my limited sphere, or to presume to tell you "what manner of men" you ought to be, you may simply regard it as a blooming illustration of the saying: "Fools rush in where angels fear to tread."

BOVINE TUBERCULOSIS.

The last Biennial Report closed with a partial report of investigations being made of tuberculosis among cattle, and of milk and the tuberculin test.

In July, 1896, the State Dairy Commissioner, upon request of the health officer of the city of Ottumwa, made an inspection of the milk supply of that city and asked the bacteriologist of the Board, Mr. J. Christian Bay, to make bacteriological tests of the milk with a view of ascertaining whether any of the tubercle bacilli could be found in the milk. There were submitted to Mr. Bay a number of samples, some of which were mixed or composite samples, and others from individual cows. Mr. Bay submitted his report to the State Board of Health, from which is reproduced the following, relative to the results of his examinations:

"I have examined, so far, five hundred and sixty-three samples of milk. Of these, three hundred and fifty-nine were from individual cows, and two hundred and four from herds; that is, composite samples.

"The samples were taken in forty or one hundred cubic centimeter-bottles, and each bottle was at once marked by the inspector, in such a way that the cow from which it came might be at any time recognized.

"First, the inspector took samples from the milk cans belonging to the different dairymen at the place. If any of these samples were found to be contaminated, the herd, or rather the milk, was kept in quarantine until the individual cows of the same herd had had their milk examined. Those whose milk gave positive response to the test were ordered removed and their milk prohibited from the market.

"*Of the two hundred and four composite samples, four, that is, about two per cent, were contaminated; and of the three hundred and fifty-nine samples from individuals, fifty-one were contaminated, that is fourteen and two-tenths per cent.*

"Should I venture to deduct any results from the facts now recorded, I should emphatically say that bacteriological analysis of milk are not sure criteria respecting the distribution of tuberculosis among cattle. I would say, however, that as long as we do yet know very little of the important laws governing the disease, and as long as the public mind and the public treasury are not prepared to undertake radical measures to eradicate tuberculosis, bacteriological examinations of milk supplies might tend to point out the cores of infections at the different places, and to point out certain—but by no means all—infected cows. Investigations along this line, if properly supported, also tend to deepen our knowledge of the entire question, and certainly are of benefit to public health in so far that the infected milk is prohibited from sale and thus from disseminating the disease. The general public is slow in comprehending scientific facts, and its mind is easily turned against what it does not understand. We, depending upon the public for the support of our work, should be very careful in regard to our proceedings in arresting the spread of consumption. We should reform, but not revolutionize."

Believing that the investigation of the bacteriologist should be supplemented by the application of the "tuberculin" test, it was suggested to the health board of that city that the Governor be requested to send the State Veterinary Surgeon, Prof. M. Stalker, there to apply this test. It was done, and the following is his report:

To the Honorable Board of Health of Ottumwa, Iowa:

GENTLEMEN—I am able to make the following report of work done to date in testing the condition of the dairy herds supplying milk to your city:

You will recall the fact that some six weeks ago your board decided to have the character of the milk supply of the city tested. To this end you caused to be made a number of microscopic examinations of milk taken from different herds. These tests were made with special reference to determining whether the cows supplying milk were affected with tuberculosis. First, composite samples taken from the milk supply of the entire herd were examined, and later, milk from individual cows was subjected to microscopic examination. So far as I have been able to collect the statistical results of these examinations, they are as follows:

Herd of F. and H. Michaels, examined twenty-seven, condemned as tuberculous six.

Herd of C. J. Prosser, examined nine, condemned as tuberculous six.

Herd of Ed. Daggett, examined forty-three, condemned as tuberculous four.

Herd of G. M. Newman, examined twenty-two, condemned as tuberculous three.

Herd of James Hatch, examined twenty-nine, condemned as tuberculous three.

Herd of H. Montague, examined twenty-five, condemned as tuberculous two.

Herd of James Marsh, examined nineteen, condemned as tuberculous three.

Herd of J. F. Bizer, examined twenty-two, condemned as tuberculous one.

I believe these are the correct figures, and in any event the variation is not such as would change general results.

After this test was made, and the sale of milk from a portion or all of the cows pronounced diseased was forbidden, your board resolved to have an additional examination. In order to accomplish this Dr. Baker, your health officer, on behalf of the board, made a formal request of the Governor to send the State Veterinarian to conduct this test. In accordance with instructions received from the Governor I have caused a careful test of all suspected herds to be made. What is known as the tuberculin test was employed, and I submit herewith the results of the examination. In the herds tested all cows, both those pronounced diseased and those known to be healthy so far as examination of milk was concerned, were subjected to the test. The herds owned by the following named parties showed no reactions and are declared free from tuberculosis:

F. and H. Michaels, Ed. Daggett, James Hatch, Jacob Marsh, J. C. Prosser, G. M. Newman, H. Montague.

In the herd of J. F. Bizer eight animals reacted to the tuberculin test and were condemned as tuberculous. Seven of these, one not being able to walk to the slaughter house, were sent to the packing house of John Morrell & Co., of your city, and slaughtered under the direction of a United States inspector employed by the Bureau of Animal Industry. These seven individuals were found on slaughter to be affected with generalized tuberculosis, and had the United States condemnation tags attached to the carcasses and sent to the rendering tanks. They were all in full flow of milk, and two were affected with extensive tubercular condition of the udder, though there were no external evidences of the fact. One animal in this herd was pronounced tuberculous by examination of the milk. This individual failed to respond to the tuberculin test.

In addition to the above described animals, the Jersey herd of J. D. Peck was tested and found to be free from disease. The herd contained fifteen cows.

To recapitulate: Nine herds have been tested, containing two hundred and eleven individuals *Of this number twenty-three cows in seven herds had been condemned as tuberculous by examination of milk. Not one of the condemned cows responded to the tuberculin test. Of the eight cows in the J. F. Bizer herd found to be tuberculous all had a clean bill of health under examination of milk, though two of them on post mortem examination were found to be affected with generalized tuberculosis involving the udder.*

Test of a few additional herds will be made, on which I will report at a later date. I am yours very truly,

M. STALKER,
State Veterinarian.

In these reports there is an apparent sharp conflict [see page 3] between the veterinary and bacteriological departments of the State Board. Not so.

It was an honest trial of the two methods recommended by prominent experimenters in their respective fields of exploration. If the two tests, applied side by side to the same individuals of a herd, should show the same results, the value of both methods for determining tuberculosis, the one test supplementing and corroborating the other, would be incalculable.

In this particular case the preference must be given to the tuberculin test since all the animals condemned by it were, upon post mortem, found to have tuberculosis. These same animals by the microscopic test were regarded as healthy. The post mortem proved the error of the finding by the microscopic test and confirmed the tuberculin test.

The State Board of Health, upon what seemed to be incontestible evidence, has approved and adopted the tuberculin test. It is waiting the establishment and reliability of the other.

RESULTS AT THE EXPERIMENT STATION.

State Veterinary Surgeon Stalker and his assistant, W. B. Niles, give the following as their experiments at the Agricultural College Experiment Station:

EXPERIMENT STATION TESTS.

It is our intention to give conclusions drawn from tests and experiments made at our station, as well as to present in a condensed form some additional and well-established facts on the subject of tuberculosis.

The interests involved are so vast, and the adoption of wise and efficient measures are so important, the subject should receive the fullest discussion with all the available facts before us. Personal interest and preconceived notions should not be allowed to influence our judgment. Recent discoveries and the application of new methods growing out of them have led to the fear on the part of some that great harm is likely to be done the live-stock interest. While much misleading and unprofitable discussion has been going on, science has been patiently observing facts and bringing new discoveries to light.

Some points have been effectually settled, truth has been approximated on others, and yet there remain for settlement many of the practical details in dealing with the subject.

The scientific aspect of the question has made more uniform progress than the practical application of the facts discovered to the eradication of the disease. The scientist has only the difficulties of discovery to encounter. A variety of interests may be antagonized by the efforts at suppressing the disease and consequent opposition developed.

Within the last few years there has been a general awakening to the vital importance of this question all through the scientific world. The laboratories of the old world and the experiment stations of the new are abundantly supplied with devoted students of sanitary science who are bringing every available means to bear on this question. From these diversified opportunities and fields of observation the problem is being gradually wrought out.

Investigators working independently of one another have arrived at the same conclusions on a number of points. This method is sufficiently conclusive in its results to set at rest discussion among scientists as to the trustworthy nature of the conclusions, and to furnish an intelligent basis for restricting the evil. It may be well to summarize at least a partial list of facts on which experimenters are so well agreed as to leave little doubt as to their accuracy. Much of the ground has been gone over by the Agricultural Experiment Stations of the more progressive States, with remarkable uniformity as to results.

The following may be said to cover a portion of the ground that has been practically cleared from doubt:

(1) Tuberculosis of the lower animals is identical with human consumption.

(2) It is an infectious disease.

(3) The disease may be transmitted from man to the lower animals, and from the lower animals to man.

(4) Tuberculosis causes more deaths in the human family than any other disease.

(5) Cows are especially susceptible to the disease, and are extensively affected by it.

(6) Milk from tuberculous cows may convey the disease to the consumer.

(7) Milk from tuberculous cows having non-affected udders may convey the disease.

(8) The flesh of tuberculous animals may convey the disease.

(9) A large proprtion of the cases cannot be recognized by clinical examination.

(10) No other test yet discovered than that afforded by tuberculin, can detect any considerable proportion of cases in the living subject, and this test is practically infallible.

(11) Injections of tuberculin cannot produce tuberculosis, nor are the results harmful.

Any one of these asseverations can be successfully defended by observations made on the part of experimenters of unquestioned credibility. Most of them have been verified in our own station work.

It is now about a year and a half since the station began the work of applying in a practical way, and on a somewhat extensive scale, the tuberculin test. The purpose has been to satisfy ourselves as to the reliability of the test, the danger if any, resulting from its use, and by conducting a series of tests in various parts of the State to gather information as to the prevalence of the disease.

METHOD OF APPLYING THE TEST.

For the benefit of those not familiar with the methods of making the test, a word of explanation will be in place.

First.—The temperature of every individual in the herd to be tested is carefully taken and recorded at intervals of two hours during the day preceding the test. The average of these readings will give a pretty accurate test of the individual temperature of the several animals, which is recorded as the normal, with which any variations are to be compared. Before midnight of the day on which the trial temperatures were taken, the injection of lymph is made. This consists in injecting beneath the skin, with an ordinary hypodermic syringe, two cubic centimeters of tuberculin for every thousand pounds live weight of animal. The result to be expected is a more or less well marked rise in temperature shown by all individuals affected with tuberculosis. If the animal is free from the disease, no change of temperature will result. The rise in temperature will usually begin to manifest itself in from twelve to fifteen hours after the injection is made. From four to six hours later, the temperature in those showing reaction begins to decline and gradually reaches the normal. It is upon this variation in temperature alone, that reliance is placed for determining the presence of the disease. Every possible precaution should be observed, that the conditions may be the

same under which the temperature was taken, before and after the injection. Varying conditions tend to slight modification of temperature, hence the necessity for the greatest precaution, that only the change resulting from the action of the tuberculin may be shown.

If a change of one and a half or two degrees occurs, this is sufficient evidence on which to condemn the animal. A rise of four or five degrees is not unfrequently noted. There is no well authenticated evidence that these marked differences in rise of temperature shown correspond to like difference in the severity of attack.

RELIABILITY OF THE TEST.

With this feature of the subject, we are especially interested. If the results obtained should not show a fair degree of uniformity under like conditions then the test may be discarded as useless. If the test proves a means of condemning healthy animals it is a harmful and dangerous experiment and should be discarded at once. If diseased ones fail to respond to the test, then it is to be regarded as a means of concealing rather than pointing out real dangers, and is worse than useless. With these thoughts before us, the work has been done with such attention to details as would insure a fair and impartial trial.

The conditions under which we have been obliged to work have not always been such as to allow all the privileges we could have wished for, in order to obtain the fullest results. It has not always been possible to secure for slaughter all the animals showing reaction. And as a matter of course we have not had the opportunity of performing autopsies on any considerable number of those that failed to show any reaction. These are regarded as healthy and are not usually disposed of in a way to afford opportunities for post mortem. Out of eighty post mortems made on animals showing reaction, not a single case failed to give evidence of tuberculosis. And in no case where an opportunity was afforded to examine the carcass of one failing to show reaction, was the disease found to exist. In other words, the test has not failed in a single instance in our experience. Occasional failures have been noted by other experimenters. Whether this was due to lack of attention to details in the work, to want of searching methods in examining the cadaver, or to actual failure in the essential features of the test, we are not prepared to say. But it would not be a matter for surprise if there should be some contradictory results

reported, owing to the many inexperienced hands into which the test has fallen. Our experience with the test, however, tallies so closely with the results obtained at other U. S. experiment stations, as well as scientific institutions throughout the world, that it may be said there is practically no disagreement among the workers in this field of investigation, as to the uniformity of the results. It may not be said of any drug in the pharmacopœia, that it is infallible in its action; that it was never known to produce other than its generally recognized effects, and that these invariably followed the administration. But this by no means breaks the law of uniformity or reverses the rule of action.

The New Jersey experiment station in its Bulletin after detailing experiments made, summarizes its conclusions by saying: "Every case of undoubted reaction proved to be undoubtedly tuberculous."

The Wisconsin station, where careful tests have been made, publishes the results in bulletin form and gives expression to the following: "We have then in this agent a means of detecting the disease if we desire. The use of this agent is to be recommended."

Dr. Law, in a bulletin issued from the Cornell University Station, speaks of tuberculin as possessing "the highest value as a test of tuberculosis in animals." He further says in the same bulletin: "This has now been employed on thousands of cows, and those who have used it most, value it most highly, whereas many who at first reported reactions in non-tuberculous animals are now acknowledging with Nocard that the fault has been mainly their own, for small tubercles were present but were overlooked through their failure to examine the bones and other organs."

The same observations have been made by workers in the Maine Agricultural College Experiment Station. In the published reports of that institution we read: "With suitable instruments and professional skill it is comparatively easy for one man to examine a herd of fifty animals in less than twenty-four hours and detect every case of tuberculosis that may exist there."

The Massachusetts Station, after a long and unsatisfactory attempt to rid the college herd of tuberculosis by the weeding-out process, decided to apply the tuberculin test. The bulletin of the station in speaking of the effort to free the herd from this

from five per cent to more than fifty per cent had been pronounced tuberculous by the microscopic examination of the milk, not a single case of tuberculosis could be found by the most painstaking test. Conversely, eight cows in one herd were proven by the tuberculin test to be affected. They were slaughtered and all gave the unquestioned proof of being tuberculous. These had passed the ordeal of microscopic test of milk with a clean bill of health, though two of them were found on post mortem examination to have miliary deposits throughout the udder.

These experiments have convinced us that the plan of microscopic examination of milk is altogether untrustworthy as a means of detecting the disease.

PHYSICAL EXAMINATION.

In cases where the herds were being subjected to the tuberculin test, careful physical examination of suspected and non-suspected cows have been made. These tests have proven to us that it is impossible to detect any considerable proportion of the cases in an affected herd, by the most careful examinations of this nature. Cases that have presented no evidence to the sense on which to condemn, or even to suspect the presence of disease, have reacted to the test, and post mortem examination has in many cases revealed extensive tuberculous lesions. These have been found in all parts of the body, including extensive diseased conditions of the mammary glands.

EXPERIMENTS IN FEEDING THE MILK OF TUBERCULOUS COWS.

The use of milk on experiment animals for the purpose of artificially inducing the disease in otherwise healthy individuals is a practical way of putting to the test some of the theories as to sources of danger. If the milk from tuberculous cows, either taken in the ordinary way or injected directly into the circulation, can induce tuberculosis, the fact becomes one of no ordinary moment. The significance of the experiment has a two-fold importance.

First.—It enables us to account for many cases of the disease in young cattle. It has been shown by repeated observations that congenital infection is rare. However, calves but a few months old are frequently found to be infected.

Second.—If milk from tuberculous cows possesses infectious properties, the health and safety of the human family become the important part of the question. If feeding the milk to lower

animals under ordinary conditions will induce the disease, there is no avoiding the conclusion that it can be induced in the human family under the same conditions. This experiment has been repeated with sufficient frequency, and under conditions to prove the certainty of results beyond question. If milk is contaminated with the bacilli of tuberculosis, it will convey the disease. But under what conditions the milk will be so contaminated, is a question for separate solution. It has been vehemently claimed that only milk from cows with udders in which the disease was localized was to be regarded as in any sense dangerous.

An exhaustive series of experiments was undertaken by the Trustees of the Massachusetts Society for the Promotion of Agriculture, with a view of gaining light on this question. One of the experiments consisted in feeding twenty-one healthy calves on milk from tuberculous cows. At the conclusion of their experiment they report: "Of these twenty-one animals, eight, or over thirty-three per cent, were shown to be tuberculous. That the cows from which the milk for these feeding experiments was derived were free from tuberculosis of the udder is shown by the results of the post mortem examination." They draw the following conclusions:

"The possibility of milk from tuberculous udders containing the infectious elements is undeniable."

"With the evidence here presented it is equally undeniable that milk from diseased cows with no appreciable lesion of the udder may, and not unfrequently does, contain the bacilli of the disease."

Dr. McKenzie reports that in cases where there were no lesions of the udder, but where tubercular deposits were found in other parts of the body, the milk in forty per cent of the cases proved to be infectious.

This is in accord with the best evidence on this subject, and especially does the extensive scientific work of Bang, of Copenhagen, coincide with these results.

Our station made experiments on three calves from tuberculous mothers. Two were allowed to take the milk from the mothers. These cows were but slightly affected, the udders to all appearances being free from disease, and no bacilli were detected in the milk when examined under the microscope. Both of these calves developed tuberculosis. A third calf from a tuberculous mother was not allowed to take the mother's

milk, but was taken as soon as born and kept on the milk of a cow that had been tested and found to be healthy. This calf never showed reaction when tested with tuberculin. It was slaughtered at the age of three months, and thorough examination failed to detect any sign of disease.

This experiment tends to show that calves from tuberculous mothers are not necessarily tuberculous at birth, but that infection will take place when the udders are healthy and when there is no external evidence of disease.

ORIGIN OF THE DISEASE IN IOWA.

It is quite impossible to trace accurately the appearance of the disease in our State. We have known of its existence among our cattle for twenty-five years, and undoubtedly it traces back to a very early period in the history of our cattle industry. We first became acquainted with it in herds of well bred cattle, especially those that were represented by imported individuals. Comparatively little was known at that time of the history and real danger from the disease, and nothing of the modern methods of detection. But long before there were any laws on our statute books making provisions for control of contagious diseases, we assisted many of our breeders in their endeavors to get rid of tuberculosis by selecting out and destroying the affected individuals in their herds. The introduction of imported animals was doubtl· ss an important factor in the introduction of the disease.

TO WHAT EXTENT DOES THE DISEASE PREVAIL IN IOWA?

The work done through this department during the last eighteen months, the occasional discovery of a seriously affected herd, and more frequently less severe outbreaks have led to the frequent repetition of this question.

While a considerable number of tests have been made, and these in various parts of the State, we are not yet in possession of a sufficient amount of evidence on this point to furnish more than an approximation to a definite answer. The evidence of the existence of tuberculosis has been demonstrated over and over, but to attempt to deal with percentages would be to enter the field of conjecture. It must be kept in mind that tests have been made where some form of disease was known to exist or was believed to be present. The unsuspected herd has not, as a rule, been tested. Under these circumstances the number of cases found to be diseased in proportion to the whole

number tested will greatly exceed the general average of cases in the State to the entire number of cattle. Again, the proportion of affected individuals in a diseased herd varies greatly. The time during which the disease has existed, the conditions under which the animals have been kept, whether closely confined or in the open fields; these and many other conditions will have a marked influence on the degree to which the herd has been invaded. We append the figures taken at random from tested herds that will show the extent to which the disease prevailed in these instances.

About fifty herds have been tested in the counties of Black Hawk, Kossuth, Story, Boone, Page, Harrison, Sac, Wapello and Floyd. Taking eight hundred and seventy-three animals as they occur in these herds that were subjected to the test, one hundred and twenty-two reacted and were pronounced tuberculous. These facts give some suggestions as to the distribution of the disease, and the per cent that may be reasonably expected to react in herds that are reported for examination.

HOW THE INFECTION IS EXTENDED.

A living vegetable organism, the bacillus tuberculosis, is the reproductive agent which gives rise to the disease. When this germ finds lodgment in suitable tissues, and is uninterrupted by any antiseptic agent, or opposing force, it tends to multiply with a certain degree of rapidity, and the results in the affected tissue is the deposit of tubercle. Any organ of the body may be assailed, though lymphatic and other glandular tissue, the lungs, liver and spleen are parts particularly prone to be the seat of disease. Any animal affected with the disease becomes a center of infection from which the disease may spread. Its distribution is never rapid, but a single case in a herd is certain to be followed by others in the course of time if unrestricted cohabitation is allowed. The bacilli are coughed up or expelled from the body through other channels. These may be at once conveyed to the body of a susceptible animal, or they may lie in a dried and dormant condition for months and be revived into activity when implanted in a suitable soil. Every individual going out from an affected herd becomes a menace to the animals with which it is brought in contact. Doubtless the sale of breeding stock has had more to do with the general distribution of the disease than any other one agency. A general indictment cannot be entered against

the breeding stock of the State, but many of our breeders can testify to the trouble they have experienced in their endeavor to free their herds from the scourge.

INFLUENCE OF MANAGEMENT ON EXTENDING INFECTION.

The fact is admitted by investigators generally, that the character of the buildings exerts a certain influence either for or against the dissemination of the disease. It is a universally admitted fact that cattle kept in ill-ventilated underground barns, with inadequate air space, furnish favorable conditions for increased contamination. This has been our own observation in conducting examinations on herds so situated. This fact has been emphasized to the extent that some have come to the conclusion that this cause alone furnishes practically all the explanation that is necessary to account for the disease in our herds. Not so. Bad sanitary conditions can no more originate the specific poison of tuberculosis than the virus of small-pox can be developed by the same methods. Both diseases may be aggravated and the cases multiplied by such exposure, but neither disease can be so generated. It is by no means true that extensive invasion of any given herd is to be found only when the animals are kept under such conditions. Some of the very worst outbreaks we have investigated were confined to animals that had never been kept in barns. In one herd of forty-one animals, six had died during the latter half of the Summer, and ten more were found diseased by the tuberculin test. These were all slaughtered and the tubercular conditions verified by post mortem examination. This herd was at pasture and had never been kept indoors. From another herd of twenty-eight animals five died in the course of three months. The tuberculin test found nine additional cases. These had never been kept in any better quarters than an open plank barn. Here were two herds that led practically an out of door life, yet they were both rapidly dying out. The Station has made abundant observations of a similar nature in other instances. If an infected individual is brought into a herd of perfectly healthy animals, it becomes a menace to the health of that herd, no matter what the conditions are under which the cattle are kept, so long as they cohabit in an unrestricted way. Let no man flatter himself that his herd is safe in the presence of a single case of tuberculosis, no matter what the exent of acres over which they may range. True, these favorable conditions will lessen the chances of infection, but they

cannot remove them. Several instances have come under our observation where badly affected animals came from the best kept breeding herds in the State.

Cases that are fairly established may be hastened rather than retarded by out door conditions when these mean exposure to all the inclemency of the unfavorable season. The protection of a comfortable barn, though not in the very best sanitary condition, may prolong life beyond the period that would be reached were the creature forced to fight for existence against storms and sudden changes of temperature.

WHAT ARE THE SYMPTOMS OF THE DISEASE?

This is one of the questions most frequently asked by the farmer. It is a difficult question to answer because of the extent of detail involved in making a full statement of the case. From what has been previously said in these pages it will be understood that almost any organ of the body may be the seat of disease. The symptoms will be correspondingly various. The pulmonary type, or that form of the disease in which the lungs are extensively affected, may be said to be the typical form. In nearly all cases where the disease is allowed to run its course, the evidence of lung affection will become apparent before death relieves the animal. This form of the disease is attended with difficult respiration, high temperature, frequent and feeble pulse, painful cough, failure of milk, emaciation, diarrhœa, and finally death. Occasionally the first symptoms may be severe lameness from tubercular deposit in the articulations. Swelling and abscesses about the throat and the udder of cows are not unfrequent manifestations. When non-vital organs are the first seat of the disease the animal may continue in a fair state of general health for months, and even years. Doubtless there are occasional cases of final permanent recovery. The disease in nearly all cases assumes a chronic type, which is misleading to the owner. But it must be accepted at once and for all, that it is impossible to detect any considerable proportion of the cases at any given time, by the most searching physical examination of the expert. If it is the fixed purpose of the owner to find the real extent of the infection in a diseased herd, he must have recourse to slaughter, or apply the tuberculin test.

RELATION OF MEAT AND MILK SUPPLY TO PUBLIC HEALTH.

That the mortality in the human family from tuberculosis exceeds the death roll from all other infectious diseases put

together, is a generally admitted fact. Statistics place the death rate from this cause as high as fourteen per cent. At some of our Indian agencies, where the habit of eating uncooked meat is a general one, the mortality statistics show that fifty per cent of the deaths is due to tuberculosis. It is a very difficult matter to determine approximately how much of the mortality from human consumption is to be attributed directly to infection from the lower animals. The causes in most of the cases are so hidden in obscurity that a definite explanation is impossible. But there is abundance of positive proof, and still more collateral evidence, to show that the food supply derived from the animal kingdom is no small factor in the distribution of the disease.

There are few experimenters, who have been close observers of these phenomena, who cannot cite cases that point at least in the direction of these conclusions.

One case came under our observation, where five young people between the ages of twenty and thirty years died of consumption from one family during a period of two years. Not a trace of the disease had ever been known in the family of either the father or mother of the victims. On the farm where the deaths occurred we found seventeen cases of tuberculosis in the herd of cattle, and others had died before the investigation was made.

Another bit of history in connection with a diseased herd that was under test, is worthy of mention. A mother and child died; the mother from undoubted consumption; the child from intestinal trouble highly suggestive of the same disease. The cow that had supplied milk to the mother and child was tested and found to be tuberculous. Post mortem examination of the cow revealed a badly tuberculous condition of the udder. Similar observations on the part of other station workers and practicing physicians have been made so frequently that the conclusion is unavoidable that to some extent to our meat supply, and in a much larger way to our milk supply can be traced many of the cases of tuberculosis in the human family.

HOW CAN HEALTHY HERDS BE SECURED, AND HOW CAN THEY BE KEPT FREE FROM DISEASE?

This is the practical question toward which all the others tend. It is of little consequence to know that disease exists unless that knowledge can be made to aid us in averting the

evils we have found. The means by which total extermination of the disease can be accomplished do not seem to be in sight. So long as there remain cases of consumption in the human family, there remains the possibility of occasional re-infection of bovines. But the probabilities of infection from this source are remote, and should not be taken as arguments against any restrictive measures that might be adopted.

While absolute extermination of the disease at once may not be practical, we believe it to be entirely feasible to so far restrict its dangers as to render them of slight consequence. The State has already, with small expense, eradicated the disease in a considerable number of dairy herds. And what is of more value to the public at large than freeing these herds from disease, it has demonstrated the possibility and the practicability of the plan, and has done much to educate the people as to the sources of danger. The result is that many owners of herds have voluntarily, and at their own expense, had the tuberculin test applied, and the diseased animals destroyed. The work the State has done, is in this way being supplemented; and the practice of testing dairy cows is likely to have a very large increase in the future, without the aid of compulsory measures. Once the herd is free from disease, it can readily be kept in this condition by exercising due precaution in the introduction of fresh stock. Dairymen who have had unfortunate experience with the disease, have adopted the practice of admitting none but tested cows to their purified herds. This practice, if uniformly adopted, would very soon render the dairy herds of Iowa free from tuberculosis. If in addition to these precautions, similar vigilance were exercised over the introduction of breeding stock to the herds, the chief sources of infection could thus be shut off. If restrictive measures of this kind were applied to these two classes of cattle, practically all the cases of tuberculosis in the State would soon be found, and its ravages reduced to the minimum. The measures adopted in a few score of dairy herds in the State, if applied to the remainder, would go very far toward eradication. It is possible to reach most important practical results without the expenditure of large sums of money or the sacrifice of important interests.

All animals suffering from the disease in any of its stages should be at once removed from contact with other cattle. It is our judgment that any plan which contemplates keeping

tuberculous animals on the farm, and attempting to avert danger by seggregation and other like precautionary methods, will defeat its own ends. The less the number of possible sources of infection in the country, the more successful will be the efforts at eradication. Buildings where tuberculous animals have been confined are to be regarded as infected, and no healthy animal should be assigned quarters in such enclosure till thoroughly disinfected.

It is true, a single test may not in every instance free the entire herd. After-infection may take place. It would be wise in those cases where a number of badly affected animals have existed, to take the precaution of applying additional tests some months after the first. All this involves care, the expenditure of a certain amount of money, and the occasional loss of an animal. But the animal already suffering from an infectious and highly fatal disease can not be considered to possess any high value. The inconvenience and expense attending such precautions are small in comparison with the loss and risk involved in allowing the disease to run its natural course in the herd, and the sale of dangerous products for human consumption.

In most cases the amount of tuberculin used has been two c. c. for animals of one thousand pounds weight. This dose has proven satisfactory, and as we believe it of decided advantage to detect every case of tuberculosis in the herd, if possible, we do not believe the use of the minute dose recommended by some, and which it is claimed may not reveal the mild cases, is advisable. Our experience with that of others goes to show that for each subsequent injection the dose should be increased above the preceding one in order to obtain a satisfactory reaction. If considerable time elapses between the injections, a reaction is more apt to follow. As a rule the first injection produces the most satisfactory results.

The normal temperature of *different* animals varies much and that the temperature of the *same* animal may vary considerably at different periods of the day. In some herds the evening (eight, nine or ten o'clock) temperature has been the maximum one secured, while in other herds the morning (eight or nine o'clock) temperature has been the highest. Our observation has been that in Summer the normal maximum temperature is reached in the evening and in the cold weather of Winter in the early forenoon.

The question of normal temperature, as has already been stated, must be carefully considered, as many things beside the injection of tuberculin may cause quite a marked change. We have not found the period of œstrum to alter, to any considerable extent, the regular temperature. In our opinion, when the animal shows an even normal temperature it can be satisfactorily tested, whether in heat, far advanced in pregnancy, or has recently calved.

When the injection is made about ten P. M.—the most convenient time, as the night work is reduced to the minimum—the eight A. M. temperature the next morning will show, in a small per cent of affected animals, a considerable rise above the normal. In a majority of cases no rise will be observed at this time. As those showing a rise reach the maximum at a later hour, there is no necessity of taking the first reading of the temperature until ten hours after injecting, unless the entire upward curve of the fever caused by the tuberculin is desired. While in a great majority of the cases the rise begins before the thirteenth hour, in rare cases the reaction is much delayed and may escape observation unless the temperature be observed, until the eighteenth or twentieth hour after injecting.

The rise, or fever, continues for several hours, reaching the maximum in a majority of cases in from fifteen to eighteen hours, after which it gradually returns to normal. Consequently, a characteristic reaction is one in which the temperature gradually rises above the normal and then gradually recedes back to normal. The degree of the rise, or reaction as it is usually termed, varies somewhat in different individuals, as has been previously stated. A majority of tuberculous animals show a maximum above one hundred and five. A few only have a temperature above one hundred and seven. The animal slightly diseased, as a rule, shows a higher temperature than one having the disease in *a severe* form. One investigator has stated that a temperature of one hundred and seven or above indicated that the lesions in that animal are microscopic. Such has not been our experience.

As to what should be considered a reaction is a very important question. All workers unite in saying that a rise of two degrees or over indicates tuberculosis, and probably all would say that a less rise may and does in many cases indicate the disease. Our experience and that of many others goes to show that a rise of one and a half degrees is sufficient to condemn

the animal as tuberculous. In some cases it is very probable that a rise of even one degree continuing for four or five hours and occurring when the reaction should occur, indicates lesions in some part of the body. We have found, as have also others, that an animal badly diseased does not as a rule react strongly, but that a physical examination of these will reveal the disease in most instances, without which it may be overlooked.

The effect of repeated injections has been considered with a view of determining whether by making a second test a doubtful record could be cleared up, the animal proven healthy or diseased, and whether by the use of several injections a diseased animal could be cured. In some cases the reaction after the second injection was less than after the first and no appreciable rise followed the third test. In these animals the amount of tuberculin used in the second test was greater than in the first, and our experience as well as that of others, indicates that in order to secure as great a rise after the second injection as that following the first, the dose of tuberculin should be increased. With a considerable increase in dose and the elapse of several weeks between tests, we believe satisfactory results can usually be obtained by testing the doubtful cases twice.

Autopsies were held on three of the diseased animals that had received at intervals ten injections of tuberculin. Two of these were fat, apparently in the best of health, and showed only very slight lesions. It seems very probable that in these animals the tuberculin exerted, to a certain extent at least, a curative effect. More observations will have to be made along this line before anything definite can be stated.

In our autopsies a bronchial lymph gland was involved in a majority of the cases. In a number of instances this gland was much enlarged, containing a number of tubercles, in different stages of degeneration, when lesions were observed in no other region. It is a noteworthy fact that in a majority of the animals found diseased and destroyed, the disease had been chronic and the lesions very limited. Nevertheless the large number of diseased animals in herds where acute cases are absent indicates that the mild case is always a source of danger.

PLATE NO. 1.

PLATE NO. 2.

PLATE NO. 7.

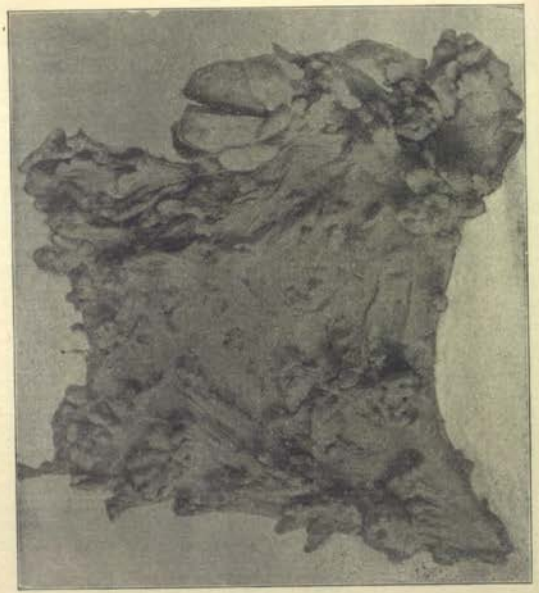


PLATE NO. 4.

DESCRIPTION OF PLATES.

PLATE 1—Grade Shorthorn cow that reacted and continued to react to the test. While not in milk she continued in thin flesh all Summer. Autopsy revealed marked tuberculosis of liver and lungs with tubercles in other regions. A case not cured by the tuberculin, nor one in which the course of the disease was apparently hastened by its use.

PLATE 2—Liver of animal shown in Plate No. 2. White spots represent tubercular areas. Organ much enlarged.

PLATE 3—Lungs of animal shown in Plate No. 2. Large white area represents a section of one lobe, showing a number of tubercular abscesses filled with a cheesy like substance from

broken down tubercles. Other lobes of the lungs also much enlarged and filled with tubercles of various sizes.

PLATE 4—A part of the mesentery from specimen in the college museum, showing presence of tubercles scattered over the surface.

PLATE 5—A portion of the omentum from a cow covered with nodules of tuberculosis. ("Grapes.")

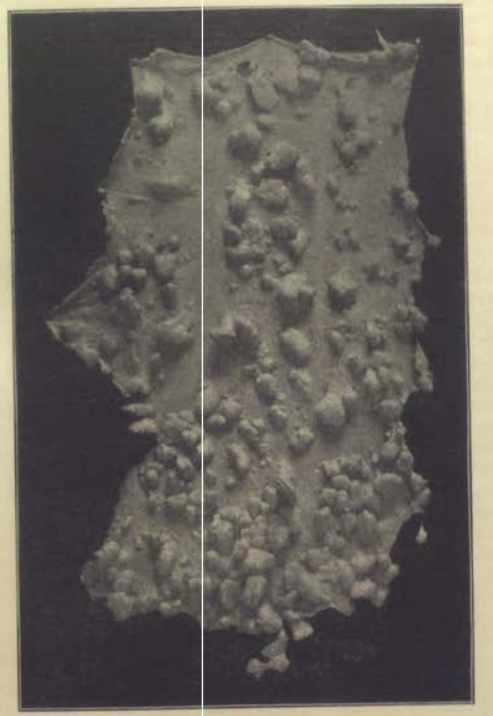


PLATE NO. 5.

EFFECT OF TUBERCULIN ON HEALTHY COWS.

There exists among cattle growers an opposition to the tuberculin test because of a possible injurious effect, especially upon dairy cows. To determine whether or not this is true a series of experiments were made by D. James Law at the Experiment Station at Cornell University at Ithaca, N. Y., in 1894. There was set apart for experimentation two Holstein cows and one Jersey in full flow of milk, being about six weeks after calving, and two dry farrow cows of common stock, one pointing to a Shorthorn ancestry and the other to a Devon. Meanwhile observations on the milk of three other cows, two Holsteins and a Jersey, in full flow of milk afforded a fair comparison between cows treated with tuberculin and others under similar conditions but without such treatment.

The first five cows each received in proportion to its size a full dose of tuberculin weekly.

The tests began October 30th and closed December 13th following.

In summing up his conclusions Dr. Law says:

"There is nothing in the records of temperature that would indicate, either at the time of the test or later, that the tuberculin had proved in any way inimical to the general health. Had the health been impaired by the repeated operation of the tuberculin it might have been expected that the constitutional disturbance would have been more distinctly marked in the later tests than in the earlier ones, and as no such tendency is observable it may be safely concluded that so far as illness can be indicated by a variation of temperature, test doses of tuberculin, in the absence of the bacillus, does not seem to produce any such illness in the healthy animal.

It has been alleged that the repeated use of tuberculin on animals slightly tuberculous abolishes the tendency to reaction under the use of this agent. If this were true it would argue rather a curative than a malific action of the tuberculin, but in other experiments I have found the second test, made a week or more after the first, to produce a no less marked reaction, so that this alleged tolerance need not be taken into account in the cases before us."

MILK RECORD.

"The milk record may be accepted as a more sensitive test of constitutional injury than temperature, breathing or pulse. It is also farther reaching than these other indications, as it

involves a healthy exercise of all the bodily functions, and above all those of appetite, digestion, assimilation and secretion. An appreciable disturbance of the health at any one point will usually be manifested in this delicate balance in a variation of quantity or quality of the milk.

"Extreme variations in the yield of milk cannot be charged on the action of a test dose of tuberculin injected into a healthy animal, nor of a series of such test doses administered at intervals of a week."

PERCENTAGE OF BUTTER-FATS IN THE MILK.

"A study of the record will fail to establish any connection between the presence of a test dose of the tuberculin in the animal body and any increase or diminution of the fat in the milk. There is no change in the percentage of butter-fats sufficient to indicate any disease or ill health as the result of the administration of repeated doses of tuberculin."

EFFECT ON BODY WEIGHT.

"The weight of the animals varied so little during the experiment that it might be said to have remained stationary.

"It may be concluded that the repeated test doses of tuberculin had in no injurious way affected assimilation, and that in the two Holstein cows it had not prevented a perceptible improvement in this respect."

POST MORTEM EXAMINATIONS.

"To complete the record the two farrow cows were killed December 5, 1894, and subjected to careful necropsy. In the main the viscera were sound. The Shorthorn grade had pus in each of the left quarters of the mammary gland in the milk sinus, the walls of which were red and thickened. When stained and placed under the microscope, the pus showed numerous cocci, but no bacilli.

"As is usual in old cows, the groups of lymphatic glands in the intermaxillary and pharyngeal regions, in the chest, the abdomen, the subcutaneous and intermuscular regions were pigmented of a dark grayish color, varying at different points, but in no case showing molecular degeneration, coagulation-necrosis (casseation), nor even perceptible congestion. In the Shorthorn grade the lymphatic glands behind the diseased mammæ were considerably enlarged."

Similar tests of cattle made by Dr. E. A. de Schweinitz at the Government Experiment Station at Washington, simultaneous with Dr. Law, fully confirm the findings of the latter.

HOG CHOLERA.

The extended prevalence of hog cholera, so-called, over the State, and the immense pecuniary interest involved, suggest the adoption of all possible means for its extermination. Experience of the most careful, experienced and practical observers and investigators has demonstrated that prevention is the only safe and reliable remedy. The following has been compiled from the Fourth and Fifth Annual Reports of the National Bureau of Animal Industry of experiments made on the farm of the Bureau, and elsewhere:

These reports have demonstrated that hog cholera and swine plague are caused by two distinct germs, or bacilli, and that they are two different diseases. The latter is so unfrequent, and the tendency is so great to confound the two diseases, it is intended herein to give information relative to cholera only.

The two diseases may exist independently. There may be cholera in a herd of swine without the plague, and *vice versa*. The distinctive feature of the plague is that it affects the lungs, and of cholera, that it affects the intestines, though the intestines are more or less affected when the plague prevails, but lung lesions are rarely seen.

In either case, treatment is not recommended, for the reason that no specific, or remedy is known in veterinary or human medicine that will cure ulcerative diseases of the large bowels, except time, careful dieting, rest, and palliation for pain, all of which it is impossible to carry out with swine. Of the numberless advertised and alleged specifics and cures, the best were tried and found of no value. The only course recommended is that of prevention.

INDICATIONS OF THE DISEASE.

The presence of the disease is indicated by a cold shivering lasting from a few moments to a few hours; frequent sneezing, followed by loss of appetite; rough appearance of the hair; drooping of the ears; stupidness; attempt to vomit; tendency to root the bedding; to lie down in dark and quiet places; dullness

of the eye, often dim; sometimes swelling of the head; eruption on the ears and other parts of the body; dizziness; laborious breathing; vitiated appetite for dung, dirt, and salty substances; accumulating of mucus in inner corner of the eyes; discharges from the nose; fetid and offensive odor of discharges from the bowels; offensive exhalations; diarrhœal discharges are semi-fluid, of greyish-green color, and often mixed with blood. In many cases on the skin on the belly, between the hind legs, behind the ears, and even on the nose are numerous red spots, which toward the fatal termination, turn purple. As the disease progresses, the animal becomes sluggish; the head droops with the nose near the ground, but usually the animal will be found lying down with the nose hid in the bedding. If there has been no costiveness, about two days before death there will be offensive, fetid discharges; the voice becomes faint and hoarse; the animal is stupid; emaciation increases rapidly; the skin becomes dry, hard, and very unclean; there is a cold, clammy sweat; and death soon follows with convulsions, or gradually by exhaustion, without struggle.

In chronic cases, or those of longer duration, the animal becomes weak, lies down most of the time, eats but little, and has diarrhœa. These cases may linger for a few weeks scattering the poison of the disease in the discharges, wherever they go.

APPEARANCES AFTER DEATH.

In acute cases of cholera after death, the spleen (milt) will be found enlarged and very black. Spots of blood from a pin head to one-quarter inch or more, will be found in the fat under the skin, on the intestines, lungs, heart and kidneys. On opening the large intestines they will be found covered with these dark spots of blood. Frequently the spots are covered with clotted blood.

Kill an animal in the chronic stage, open the large intestines, and there will be found circular yellowish, or dark spots, or ulcers. These ulcers may be frequently seen from the outside so soon as the bowels are opened.

In the plague the lungs are the principal seat of disease. The bowels may become involved, but there are not present the peculiar ulcers as in cholera. The rectum is usually invaded, which is seldom the case in cholera. The plague is transmitted to other animals only by contact.

CAUSE OF THE DISEASE.

Hog cholera is analagous to typhoid fever, dysentery and Asiatic cholera in man. It is the unanimous opinion that these diseases are transmitted through drinking water. It is spread by a specific germ, or bacillus, in many ways, to-wit:

Pigs purchased from infected herds, or by coming in contact with pigs from infected herds, or by running over ground occupied by diseased swine within one year previous, may, and frequently do, contract the disease. There are, frequently, cases where animals of an infected herd will live several months after the disease has apparently entirely subsided without a sign of it, when they will suddenly die.

Infected streams may communicate the disease to herds below the source of infection. Experiments have shown that hog cholera germs (bacilli), will live and retain their virus four months in water. This would be ample time to infect every herd having access to streams below the source of infection.

The virus may be carried in feed, implements, and on the feet and clothing of persons from infected herds and premises.

The cholera germs retain their vitality from two to four and six months in the soil. They are not destroyed by drying. Hence, a person walking over infected ground may carry away the dried germs on his shoes and clothing to a neighboring herd. Animals feeding upon the carcass of dead cholera hogs will convey the disease germ wherever they go. The spread of the disease has been traced to sheep, dogs, rats, and mice, the latter especially.

Pigs become infected by feeding on the discharges and urine of sick hogs, and the carcasses of dead hogs.

HOW THE DISEASE SPREADS.

Hog cholera germs have never been found in soil or water independent of the disease. Neither have they ever been found except in the body or discharges of diseased hogs, and from these the infection spreads.

The report of the Bureau for 1896 says of the sources of infection:

1. The chief carriers of the infection are the swine themselves. This disease having its chief seat in the intestines, a discharge of bacilli from the ulcers of chronic cases, or such as have survived an attack, may take place long after the subsidence of an outbreak, or after they have changed hands.

Infection may thus be carried over in the herd until a new susceptible generation of young swine appears to continue the losses. Outbreaks occurring without any traceable importation of infection from without are very probably due to latent infection in the herd itself.

2. The custom prevailing in some parts of the country of not promptly removing dead hogs, or of allowing them to be gnawed at or even partly consumed by the living is a potent cause for the perpetuation and strengthening of the infective agent. In such cases the bacilli consumed may cause mild, unrecognizable attacks, with discharge of bacilli from the bowels subsequently.

3. Preventive inoculation with living cultures may disseminate and perpetuate the disease, because the attenuated vaccinal cultures may regain their normal virulence in the body of the swine after a certain lapse of time.

4. The waves of epizootics which appear to sweep over the country at long intervals may be due to a sudden increase in virulence of the specific bacilli after they have been passed through the body of swine for some years.

5. Pathogenic bacteria are always a menace, and no pains should be spared to restrict their dissemination and multiplication in every possible way by quarantine, by disinfection and by the destruction of the dead with fire if possible.

The report cites a case where a farmer threw dead hogs over a fence and carrion birds fed on the carcasses. Within a week a fearful epidemic of the disease spread over the surrounding country. The evidence was conclusive that the germs of the disease were carried on the feet and legs of the birds.

There is a practice in some parts of the country of gathering young pigs from localities through the intervention of dealers. In regions where swine diseases are prevalent much of the time, and where the virus never dies out, this is a specially dangerous practice. While swine may not be visibly diseased, or may simply appear somewhat unthrifty, they still may carry the seeds of a violent outbreak within them, which need a little time to gain the required momentum. The mild character of the disease in any one animal is no evidence of the character of the germ. For this mildness may be due to a very virulent germ acting upon a highly insusceptible animal and causing a more prolonged chronic disease. In fact, these

partly insusceptible animals are the most likely to appear in the markets because they are the remnants of herds destroyed by the disease.

HOW TO PREVENT THE DISEASE.

1. So soon as a herd becomes infected, the healthy animals should be immediately removed from the sick so far away there will be no danger from infection by contact, drainage of the soil, water, or gusts of wind. They should be given ample space so that if there are diseased animals among them it will not spread so rapidly as when they are crowded. The bodies of those removed may be disinfected by pouring over them a two per cent solution of carbolic acid, or two and one-half ounces of acid to one gallon of water, and also driving them through the solution to disinfect their feet.

2. Destroy all diseased animals. As there is no reliable means of treatment or cure, destruction is the simplest and most economical in the end. A single diseased animal will soon infect a herd.

3. Each dead body should be buried so deep no animal can get at it. It should be covered with a layer of slacked lime several inches thick. If burned, care should be taken that parts not burned are buried as above. The sale and carrying of such dead bodies to rendering establishments, a most prolific means of spreading the disease, should be prohibited by law.

4. There should be frequent and thorough disinfection of the premises, and cleanliness maintained. Slacked lime is a good disinfectant for hog cholera, using one pound of lime to a gallon of water. It may be used as a whitewash on fences and pens, and spread over the soil in a thin layer, and thrown into pools, hog-washes, or wherever water stagnates. A more efficient disinfectant is crude carbolic acid, costing about one dollar per gallon, and an equal quantity of sulphuric acid. The two acids should be carefully mixed in a glass jar or bottle, and poured slowly into water in a wooden pail, in proportion of two ounces of the acid mixture to one gallon of water. This should be used with a broom or brush upon woodwork, fences, pens, floors, tools, etc., and also dashed over the soil. For shoes and boots, brush them with a mixture of one-fourth ounce of carbolic acid and one-half gallon of water. Pails, after use, should be rinsed with water to prevent the acid from destroying the iron hoops.

5. All manure from sick hogs should be disinfected before removal.

6. After a disinfection of the premises, no hogs should be allowed thereon for at least four months. Where a few animals are left, that have been exposed, no fresh animals should be added to them for six months. If it is necessary to put fresh animals where the disease had been, as in stock yards, etc., then all prior infected animals should be killed, and the premises thoroughly disinfected as stated.

7. Sick hogs should not be permitted to stray into out-of-the-way places, under buildings, and into fence corners, or under straw stacks, thus scattering the disease, and rendering disinfection impossible. They should be penned or closed in a yard where proper attention can be given them, and other hogs kept from them.

8. Where no disinfection is had, hogs should not be admitted on premises where the disease has prevailed within one year. It is believed that the cholera germs will lose their vitality entirely in one year.

9. All domestic animals, especially sheep, that have been in contact with diseased hogs, should be enclosed away from other animals, and closely watched.

10. No person from a farm or premises where hog cholera does exist or has existed, should be permitted to come on premises where the disease does not exist, unless previous disinfection of his boots and clothing is had.

11. All birds, wild or tame, should be excluded from infected premises.

After all this trouble, there still remains the danger of a fresh introduction of the disease. It is difficult for one farmer to protect himself, when constantly menaced by his neighbors. Still, it is much easier to keep it away than to eradicate it. It is best, therefore, in those regions where the disease is always more or less present, to keep the hogs in more limited space, and enclosures of such form and size that disinfection may be had with less labor and more definite results.

It is confidently believed if these rules be faithfully observed wherever the disease exists, hog cholera can be permanently eradicated from the State.

Though Winter freezing will not destroy the germs, there is good reason to believe they will not survive more than a year in any soil. But it is carried and distributed, throughout the year, from places where cases have occurred, and thus the virus is kept alive. Hence the necessity for extensive concerted action among farmers.

TRICHINOSIS.

The 12th December, 1895, Dr. W. H. Goodenow, of Goodell, Hancock county, reported that he had five patients, whom he believed had been poisoned by eating uncooked salt pork. Portions of the meat were procured and when placed under the microscope, the characteristic encysted parasite, trichina, was found in large numbers. A sample of the meat was sent to the Bureau of Animal Industry at Washington and the following response was received:

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
WASHINGTON, D. C., December 23, 1895.

DEAR DOCTOR—The specimens with your letter of December 19th were received to-day, and have been examined. We concur in the diagnosis of trichinæ, and are of the opinion that the infection of the pork is a comparatively recent one. I have already written to Dr. Goodenow for details concerning the hog. Respectfully yours,

D. E. SALMON,
Chief of Bureau.

After a long and painful illness the sick recovered.

The lesson taught by this outbreak is that eating of animal flesh whether fresh or "cured," without cooking, is dangerous; and it needs repeating often.

Portion of human muscle enclosing a single capsuled trichinæ. Highly magnified. By Leuckart.

The trichinæ are readily distinguished into male and female. The sexually mature male measures $\frac{1}{12}$ of an inch in length, and the female $\frac{1}{6}$ of an inch. As found in the pork, when used as meat, they are always in what is called the encysted form. In the sexually mature state they are found in the intestines or in the discharges therefrom. When trichinous pork is taken into the stomach, the conditions being favorable, the little coiled or encysted worms, which were dormant, and if not taken into the stomach would have forever remained dormant, become vitalized, and by the eggs they secrete rapidly multiply, many thousands originating from one parasite. In two days the little larvæ coiled up in the muscles of the uncooked meat eaten, become sexually mature and active; in six days the little embryos are born, a numerous and restless progeny. Those that are not thrown off by the intestinal discharges of the patient, begin migrating. They pierce through the coats of the stomach, and while they seem to have a special affinity for for some muscles they may be found in more or less numbers in all muscular tissue except that of the heart. As soon as the trichina reaches the end of its journey, be it long or short, so it reaches a proper muscle of the body, it coils itself up and becomes encysted. After they are once encysted, provided by their wanderings they have not killed the patient, they may be carried about during a long lifetime without any special inconvenience. It takes about two weeks for them to become encysted. When thus dormant they are surrounded by a capsule or sheath. During the migratory period the patient suffers intensely.

All authorities agree that a moist heat of one hundred and seventy degrees Fah. will effectually kill the parasite. Some say that one hundred and fifty degrees Fah. is amply sufficient. A ham if boiled for an hour would be rendered safe. Dr. Lewis, after a number of interesting experiments, ascertained that the center of a leg of mutton in five minutes after boiling began acquired a temperature of one hundred and seven degrees Fah.; so it would be safe to assert that a ham boiled for an hour would, if trichinous, have all the parasites destroyed and could be eaten with impunity. Don't eat *raw* meat, especially pork. Better have all meats well and thoroughly cooked.

CIGARETTES.

The crusade against the cigarette, which was begun six years ago, is slowly but surely progressing. The increase in the manufacture is enormous. The following statement shows the sale of cigarettes and cigars in the United States since 1868:

	CIGARETTES.	CIGARS.
869	1,566,993	999,535,934
870	13,708,833	1,139,420,774
1871	18,871,013	1,313,913,604
1872	20,678,000	1,507,014,922

	CIGARETTES.	CIGARS.
1873	27,080,500	1,779,946,596
1874	28,541,500	1,857,979,298
1875	41,297,883	1,419,586,568
1876	77,420,586	1,828,807,396
1877	148,846,257	1,799,412,920
1878	165,189,594	1,904,825,887
1879	238,276,817	2,019,234,470
1880	408,701,366	2,367,803,248
1881	567,386,983	2,682,620,797
1882	554,045,886	3,040,975,395
1883	739,902,503	2,403,849,392
1884	907,945,140	3,454,969,610
1885	1,058,650,280	3,358,849,433
1886	1,310,925,800	3,500,862,293
1887	1,584,494,400	3,788,305,443
1888	1,862,726,100	3,844,726,650
1889	2,151,486,160	3,867,385,640
1890	2,233,254,680	4,087,889,983
1891	2,684,538,760	4,474,892,767
1892	2,892,982,840	4,548,799,417
1893	3,176,693,700	4,814,197,117
1894	3,181,574,760	4,066,917,433
1895	3,786,624,057	4,127,607,527
1896	4,668,020,352	4,237,755,943

While the increase in the number of cigars sold in 1896 over the number sold in 1895 was only 74,197,107, the increase in the consumption of cigarettes was 881,396,295.

It is estimated that ninety-seven per cent of cigarettes sold in the United States, are made by the tobacco trust monopoly known as the American Tobacco Company, with a capital of thirty-five million dollars, and with its profits over three million dollars a year, it has secured control of the business.

In the United States, cigarettes are principally made by machines which turn out two hundred and seventy-five a minute. Each manufacturer, who is a member of the trust uses a different combination of tobacco, the preparation of which is a close secret. A mixture of various essential oils and drugs, among which are said to be opium, valerian and canabis indica, so that each different kind creates a special drug habit, to which smokers confine themselves exclusively. The paper used for wrapping is made in France and, it is claimed, is made from rice. Chemistry shows it also contains arsenic.

The deleterious effect of cigarette smoking, especially upon youth, has aroused public sentiment to an effort to abolish the noxious article. Recent investigation among the public schools

of Chicago disclosed cigarette smoking to an alarming extent among the pupils. The teachers and parents, while familiar with the result upon the children, were astonished at the large number addicted to the habit. The mothers became aroused, public meetings were held by the various women's clubs to devise measures to stop the demoralization of the schools. Mrs. Mary D. Olson, principal of the McCash school, stated at one of the meetings that the vice had increased to such an extent in three years in the schools, that nearly three thousand boys had been found who smoked cigarettes. She said:

Some pupils are so affected mentally and physically that they can make no progress in their studies. The boys tell it themselves, and half of the principals know it. Some of these boys smoke from two to twenty cigarettes a day, and not more than ten boys out of one hundred and twenty-five whom I have observed while under my charge could keep pace with their class. Yet nine-tenths of them belong to educated and intelligent families. Among these one hundred and twenty-five boys were found nearly all of those pupils who were from two to five years older than the average age of children for the grade. All were in the habit of playing truant.

From frank and friendly talks with twenty-five of these boys, all confessed that they were too sleepy to study; thirty of them said they were dizzy after smoking, twenty-two could not write neatly because their hands trembled, several said they felt shaky when they walked. A large number were unable to run any distance, not more than half a block, yet before they began to smoke they were as quick and lively as their fellows. After careful investigation of the cases of ten boys who were from four to five years too old for their grades, I found that each one began going to school about the age of six and had made a grade or more a year up to the time he began smoking, when all progress stopped. Several of these boys had even dropped back a grade or two. A number who had joined an anti-tobacco society succeeded in breaking off the habit entirely, and all expressed themselves as feeling like different beings. Those of them who had been the poorest in their class became the best.

These boys told me they never spent a cent for candy or fruit; every penny went for cigarettes. Some even filched cent pieces from the change given them after a purchase at the grocery or butcher shop. And yet all these boys told me they had never taken money for any other purpose than the buying of cigarettes. I will add that I believe them.

Wishing to obtain the consensus of opinion of the principals, both as to the prevalence of the habit and its disastrous effects, knowing that many of them had given the matter their attention, I sent a circular letter to every school in the city, asking the following questions: First, the number of cigarette smokers in each school; second, the number of those up to or above the average in scholarship; third, the time usually required by a smoker to do a year's work; fourth, the effect of the habit on the memory, mind, morals and health.

In answer I received replies from one hundred and fourteen schools. Twenty of these were unable to determine the number of pupils addicted

to the habit; of ninety-four making reports, six schools stated they had no cigarette smokers, having abolished the habit through anti-tobacco societies. From the eighty-eight remaining schools four hundred occasional smokers and two thousand four hundred and two addicted to the habit were reported, with only two hundred and sixty-six, or eleven per cent, able to do the work of the class. Omitting the report of three schools which gave a total of four hundred and three smokers, with one hundred and fifty up to grade, only six per cent, or one boy in sixteen, was able to do the work of his grade. As there are two hundred and thirty-five schools in Chicago, including high schools, and as ninety-four of these report two thousand four hundred cigarette smokers, it is safe to say that making a conservative estimate, there are five thousand cigarette smokers in our city schools, not more than four hundred of whom are able to do good work. All the principals were agreed that the effect on pupils in the first grade was more disastrous than on others in higher grades. Sixty-seven grammar schools reported a total of forty-six cigarette smokers who had graduated within the last two years, or an average of only one smoker to three schools who had graduated within a year. There are few cigarette smokers in the seventh or eighth grade, for the obvious reason that they never reach those grades. The effect on high school boys is equally disastrous.

Mrs. C. M. Towles, of the Garfield school, and Vice-President of the Teachers' Club, said:

It is almost impossible, unless one devotes himself especially to the investigation of the fearful enormity of the cigarette habit among school children, to appreciate to what extent it has grown. At the very lowest estimate between two thousand and three thousand children now attending schools in this city are slaves to the baleful little paper cigar. In almost every instance these children are defective in hearing and seeing. They are listless and nervous and range in age from seven to fourteen years. They can't keep up their work, and in fact cannot keep still while at their desks. I have boys in my school who are in the fifth grade who can hardly see. They are careless, and pay no attention to their instructions. In a moral sense, also, the effect of smoking cigarettes is bad. Confirmed smokers will lie and steal. One little fellow in my school stole the contribution box of pennies contributed for the benefit of the Children's Aid Society. With the purloined pennies he purchased cigarettes.

Miss Wentworth, of Farragut school, said:

I have two boys in my school, both thirteen years of age, who are apparently confirmed slaves to the cigarette habit. One of these is in the third grade, when in reality the child should be on the eve of graduation. At least he should be in the eighth grade.

This is a fearful record. It so aroused public sentiment that the city council, by ordinance, provided for a heavy license to regulate the traffic, with severe penalties for selling or giving away to minors, and the whole business was put under police surveillance.

Nor is Chicago, with a sale of fifty million cigarettes per year, alone in this regard. The Boston *Globe* gives the following:

The cigarette, though small, has a very large story connected with it. It is smoked by the old and the young, by the rich and the poor, at home and abroad, after lunch, between acts at the theater, in all countries and by all races.

A very odd thing about cigarettes is that the brand used in the East does not appear in the West; those sold in the North do not sell in the South.

Many brands of tobacco-covered cigarettes are made, but they do not find a very ready market, the paper-covered cigarette being the favorite.

Most of the cigarettes sold in this section of the country are made of domestic tobacco, although a large quantity of high-priced Turkish tobacco is being used by those who can afford the luxury.

One of the largest dealers in Boston sells one million each week; there are three more that sell five hundred thousand each, five that dispose of one hundred thousand each, and two that sell two hundred and fifty thousand per week. This makes a grand total of three millions five hundred thousand sold each week by these eleven dealers.

Naturally not all of these are sold in Boston, but the greater part of them are sold in towns close by and are undoubtedly smoked by people who are employed in the city.

This would make every year the sum sold reach one hundred and eighty-two millions, which would give every individual in the city of Boston one cigarette each day in the year and still have a reserve fund.

The North End exceeds all other sections in the city in smoking cigarettes. On Salem street there are three manufacturers who sell direct to the consumer. Two use domestic tobacco and make about forty thousand each per month. The other sells about twenty-five thousand each month and sells tobacco (Turkish) and paper to the consumer direct; the cigarette is rolled by the smoker himself. He sells each week five boxes of books, each box containing seven thousand two hundred papers. This would make three million two hundred and twelve thousand sold on Salem street.

The Turks and Armenians and some of the Poles are experts in rolling cigarettes, and they smoke only those rolled by themselves. The fourteen dealers quoted dispose of one hundred and eighty-five million two hundred and twelve thousand cigarettes a year.

The largest factories in the world are in this country and are nearly all owned by one company, who made three hundred and six million last year.

Although a great many cigarettes are imported into this country, there are many more exported.

A New York oculist reports that a disease of the eye had appeared which, after careful investigation, was found to be confined to smokers of cigarettes. The symptoms were dimness of vision and an intermittent film-like formation over the eye, obstructing vision and requiring long treatment for a cure. It is known among oculists as the "cigarette eye."

State Boards of Health have been actively engaged in pointing out the dangers of the habit and in efforts to secure restrictive, if not prohibitive, legislation against it.

At the August (1896) meeting of the Iowa Board Dr. Emmert, of the Board, presented the following paper, which was most cordially accepted:

"It is the duty of the State Board of Health in every way possible to help to educate the people in sanitation, including any practice that may lower the vital standard and degrade or demoralize the individual. Believing matters of this kind should at least be agitated by this Board I desire to present a few thoughts as well as a resolution upon one of the most dangerous, degrading and growing habits of the present day; that of cigarette smoking. If my information is correct, it is often made from the stumps and partly smoked cheap cigars collected from the streets, alleys, dens and slums of large cities, by persons who are as filthy as the degraded and diseased creatures who throw them away.

"After a cigar is partly smoked and allowed to lay some time it undergoes some kind of a change, chemical or otherwise, that will produce nausea in the oldest smoker, showing this change has a powerful effect upon the nervous system, and must be detrimental to health. If this was all it would not be so bad, but at least seventy-five per cent of the manufactured cigarettes upon the market are impregnated with opium, arsenic, cocaine or some other enslaving drug. This is not smoked like a cigar, but the smoke is drawn into the lungs, where the poison is deposited upon the sensitive and delicate mucous membrane of the lungs. The anatomical structure and physical action of this membrane is such that the poison enters directly into the arterial circulation, exerting almost immediately its action upon any and all of the organs. But the chemical history demonstrates its peculiar affinity for the nervous system. What makes this habit more dangerous is its being the boys' and young men's cigar.

"The adolescent, we know, are much more susceptible to any kind of poison, and their effects are more injurious, permanent, and more liable to interfere with normal function. The poison, whatever it is, I repeat has a peculiar affinity for the nerve centers. We find boys addicted to this habit —some become unreliable, dishonest, untruthful, in fact a general lowering of the moral tone. The skin takes on a peculiar yellowish-blue cast, resembling very much the cachectic appearance of malignancy. He has mal-digestion and mal-nutrition. His mental perceptions are blunted and his capacity for study or learning is reduced. Consequently he falls behind in his classes and soon drops out of school, to become a street loafer or criminal, and consequently a menace or burden upon society and the State.

"These are briefly some of the effects and dangers of cigarette smoking. I believe the laity are unconscious of the dangers of this growing evil, and that it is the duty of this Board, so far as it is in their power to do so, to enlighten them."

He presented the following resolution, which was unanimously adopted:

"*Resolved*, By the State Board of Health, that in its judgment the habit of smoking cigarettes should be condemned because it is deleterious to health by producing nervous disease, lowering the moral tone, and checking the mental, moral and physical development, especially in the young."

In several States laws have already been enacted prohibiting the sale of cigarettes to minors, but they have proved unsatisfactory, in that they were constantly evaded by the purchase by adults who supplied them to minors, and there was no definite means for enforcement of the statute. The latest and most efficient means of controlling the traffic is by a system of taxation, which is embodied in the acts of the last legislature, and which take effect the first day of October, 1897, and which are as follows:

SEC. 5. No person shall directly or indirectly, by himself or agent, sell, barter, or give to any minor under sixteen years of age, any cigar, cigarette, 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.

SEC. 7. No one, by himself, clerk, servant, employé, 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 the 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 the county jail not to exceed six months; provided, that the provisions hereof shall not apply to the sales of jobbers doing an inter-state business with customers outside the State.

SEC. 8. There shall be assessed a tax of three hundred dollars per annum against every person, partnership, or corporation, and upon the real property and the owner thereof, within or whereon any cigarettes, cigarette paper or cigarette wrappers, or any paper made or prepared for use in making cigarettes or for the purpose of being filled with tobacco for smoking, are sold, or given away, or kept with intent to be sold, bartered or given away under any pretext whatever. Such tax shall be in addition to all other taxes and penalties, shall be assessed, collected and distributed in the same manner as the mulct liquor tax, and shall be a perpetual lien upon all property, both personal and real, used in connection with the

business; and the payment of such tax shall not be a bar to prosecution under any law prohibiting the manufacturing of cigarettes or cigarette paper, or selling, bartering or giving away the same. But the provisions of this section shall not apply to the sales by jobbers and wholesalers in doing an inter-state business with customers outside the State.

WATER.

As pure and wholesome water is one of the most important essentials of life so is the prevention of the contamination and pollution of water intended for domestic use one of the most important questions before sanitarians of to-day.

It is admitted that pure water is essential to the health of a people. How and where shall it be obtained? Nature has covered nearly two-thirds of the surface of the earth with water. She has also filled the earth with water. Man has polluted it. In cities and towns the soil becomes filled with filth; cesspools and vaults—abominations which should not be tolerated—are made the environment of homes, and the wells become polluted. Increasing demand culminates in public water-works, and rivers and lakes are selected to furnish a water supply. Into these, however, are carried vast quantities of filthy substances—the wastes of communities along their borders. Nature does much to change these into harmless compounds by filtration, sedimentation, aëration and oxidation, but there is a limit to this. The soil becomes saturated and the river and lake overburdened with impurities.

The remedy is:

1. Stop the pollution.
2. Get a new and purer supply.

SOURCES OF WATER SUPPLY.

The sources of water are:

1. Cisterns.
2. Wells.
3. Springs.
4. Lakes.
5. Rivers.

These are all subject to pollution, and constant vigilance is required to prevent them from becoming dangerous to the public health.

POLLUTION FROM PERCOLATION.

The pollution of wells affects the larger portion of the people because of their more general use. These may be contaminated in two ways:

1. The surface water from rain, house-slops, and barnyard may find its way into the well at or near the surface.

2. The ground-water stream supplying the well may encounter drainage from privies, cesspools and barnyards a long distance away and disease germs thus be conveyed therein. The danger of typhoid bacteria entering the water should always be considered. They may be washed in from cesspools, through fissures in the earth or by passages dug by rats. Beside typhoid bacteria other organisms, which cause many severe troubles of the digestive organs, may be carried into the well.

To prevent to the greatest extent possible the contamination of the well, says *Farmer's Bulletin* No. 43, United States Department of Agriculture: "The surface of the ground about the well should be kept free from manure, slops, and other waste water; hence the well should not be dug under or close by the house, nor should it be located in the barnyard, where the ground is usually saturated with manure. It should be surrounded by turf, and not by richly manured, cultivated, or irrigated soil. The ground immediately around it should slope gently away from it and be paved if possible. The waste water from the well should not be allowed to soak into the ground, but should be collected in water-tight receptacles or else conducted at least twenty-five feet away in open or closed channels which are water-tight.

CONSTRUCTION OF WELLS.

"The well itself must be so constructed that impurities can not get into it from above or from the sides. If water can soak into it after passing through a few feet of soil only, it can not be regarded as secure from pollution. To prevent this, the well may be provided with a water-tight wall built of hard-burned brick and cement down to the water level. The outside surface of this wall should be covered with a thin layer of cement, and clay pounded and puddled in around it. Or, tile may be used to line the well and the joints made water-tight with cement down to the water level.

"These different devices are all designed to keep water near the surface of the soil from percolating into the well. To keep

impurities from entering the well directly from the top considerable care is necessary. Such impurities are likely to prove the most dangerous because there is no earth filter to hold them back and destroy them before they can reach the water. Adequate protection above may be provided in several ways. The sides of the tiled wells should project above the surface and be securely covered with a water-tight lid. The ordinary well should also have its sides project above the surface and a water-tight cover of heavy planks provided, which should not be disturbed excepting for repairing or cleansing the well. Under no circumstances should objects be let down into the well to cool. A still better method of protecting the water from above is to have the lining wall of the well end three feet below the surface of the ground and to be topped there with a vaulted roof, closed in the center with a removable iron or stone plate. The top should be covered with twelve inches of clay or loam; above this there should be a layer of sand, and lastly a pavement sloping away in all directions.

"Too much care can not be bestowed upon the household well. It should be guarded jealously and all means applied to put the water above any suspicion of being impure. This is especially true in dairies where well water is used in cleaning the milk cans, and where steam and boiling water have not yet found their way for this end. Polluted wells in such houses not only endanger the health of the inmates but that of a more or less numerous body of city customers."

It is an easy matter, by surface or sub-surface irrigation, to dispose of the slop-water, soapsuds from washing, chamber-slops, urine and other fouled water, and all the refuse and waste from the house, so as to prevent contamination of the well, especially where there is a garden, lawn, trellis, fruit trees or orchard. The slop-water should be collected every day, in a tight tank, and conveyed to the garden or yard and used for watering plants, shrubbery, trees or vegetables, or it may be discharged into absorption drains laid under ground by having near the house a hopper or receiver (Fig. 1) of wood or rustless iron, provided with a strainer and tight cover. From this a pipe may be carried underground to absorption tiles laid with open joints. The

Fig. 1.

house sewage may be discharged into the hopper from a pail with slop-water, thus sending a full volume of slops at proper intervals into the soil. The principal importance is that the sewage be applied to the soil while fresh and before decomposition begins; that it be applied on or near the surface, within reach of the oxidizing influence of the air and of the bacteria of the soil; that it be made at intervals to give the soil opportunity to respire, as it were, and permit the finer particles to be oxidized and destroyed.

Respecting this system Wm. Paul Gerhard, the well-known sanitary engineer, in his "Disposal of Household Waste," says:

The system is based upon the well known fact that the aërated layers of soil *next to the surface*, the sub-surface as it were, possess in a high degree the power of destroying organic substances buried in them, by nitrification and oxidation, aided during a part of the year by vegetation, and assisted at all times by minute organisms or bacteria. The latter play an important part in the round of changes in nature. "They are," says Tyndall, "by no means purely useless or purely mischievous in the economy of nature. They are only noxious when out of their proper place. *They exercise a useful and valuable function as the burners and consumers of dead matter, animal and vegetable*, reducing such matter with a rapidity otherwise unattainable to innocent carbonic acid and water. Furthermore, they are not all alike, and it is only restricted classes of them that are really dangerous to man. One difference in their habits is worthy of special reference here. Air, or rather the oxygen of the air, which is absolutely necessary to the support of the bacteria of putrefaction, is, according to Pasteur, absolutely deadly to the vibrios which provoke butyric acid fermentation."

I lay particular stress upon the importance of distributing the sewage close to the surface of the soil, at depth not exceeding ten or twelve inches. Aëration is a *conditio sine qua non* of the whole system. At greater depths oxidation and purification become very much slower until they cease altogether. The *sub-soil* is not able to effect a complete purification of sewage, as the oxidizing influence of the atmosphere does not so freely reach it. It is the layer of earth next to the surface, the *sub-surface*, which acts on the sewage. Hence the name of the system is derived, and it is an error committed quite frequently, and to which I have more than once called attention, to call the system "sub-soil" irrigation.

We see, then, that only where sewage is distributed close to the surface, where sufficient oxygen attaches to the particles of the soil, are the organic matters in it taken up as nourishment by the roots of plants, and reduced or destroyed by the bacteria in the soil. The liquid sewage, freed of its coarser impurities, soaks away into the porous ground, and thus becomes still more clarified by filtration, so that when removed by deep underdrains, it is generally found to be quite clear, colorless, free of taste or smell. By arranging an *intermittent* discharge, the upper layers of the soil are enabled to take up oxygen during intervals between discharges, and to prepare for the next volume of sewage, while the ground is prevented from becoming saturated, wet and swampy.

By this method the household waste is carried away from the well, and the contamination of it avoided. It is, of course, assumed that the general topography of the premises is favorable to such a system.

A more extended and elaborate system is that of sub-surface irrigation, by which the household waste is distributed over a large area. It consists of a water-tight tank, which may be emptied by hand, or automatically by a siphon, ball float, or other device, as in Fig. 2. Tiles are laid, at a fall of about two or three inches per one hundred feet, to a small sewage farm, some distance away—not less than one hundred feet, from a well where the sewage may flow in shallow trenches. Fig. 2 illustrates a more complex system of underground tiling in branches. To avoid overloading the soil with sewage at any one place the main distributing trench should be so arranged that it and the irrigating trenches branching from it may be temporarily blocked at any point to divert the sewage into one or more different trenches every day. In Winter the warmth of the sewage will keep it in motion and the filtration will go on although the field may be covered with snow and ice. The use of the flush tank as described above would cause a more uniform distribution of the fluid over the field and make the filtration distinctly intermittent. The ground between the trenches may be cultivated to increase the amount of evaporation. If conveniently situated, an orchard may be used as the irrigation field. It should be distinctly understood, however, that marketable fruits and vegetables should not be carelessly allowed to come in contact with fresh sewage, nor should the irrigation field be near the well unless the latter is fairly deep and tubed or tiled to the surface of the water.

Fig. 2.

POLLUTION OF RIVERS.

Aside from wells, rivers and streams are the next greatest source of water supply, and as a rule they are the carriers of the sewage and effete products of cities and towns. They swarm with germs or bacteria, a glassfull often containing millions of them. Fortunately all of them are not harmful—in fact most of them are true scavengers. There are but very few pathogenic, or disease-producing bacteria. Dr. Sternberg names sixteen, while Professor Frankland names twenty-three. Most of these are rarely found in the streams or waters of this State. It may be safely said there is but one—the typhoid bacillus, which is unquestionably water borne. Hence it may be laid down as a rule that the mortality rate of any community from typhoid fever is a true indication, or measure, of the purity of the water supply. This is more fully set forth on page 145 *et seq*.

The typhoid bacillus comes from sewage. Its vitality is surprising. It is not killed by freezing. Hence, in connection with public water supplies it becomes a subject of great importance.

The question arises here: "Can a river once polluted, ever be a safe source of supply below the point of pollution?"

Upon this question Dr. Geo. M. Kober, Medical Sanitary Inspector for the District of Columbia, says, in his report to the commissioners of the District, December, 1895:

> The question of self-purification of rivers has been earnestly studied, and the conclusion has been reached that a certain degree of purification is possible by natural means, viz:
>
> 1. Dilution of the sewage with clean or unpolluted water which empties into the stream along its course.
>
> 2. By deposition of the suspended matter carrying with it some of the organic material.
>
> 3. By the agency of fish, water plants, algæ and infusoria, which require organic matter for their food.
>
> 4. By the bacteria of nitrification which are so largely instrumental in the process of oxidation of organic matter; it has been shown that the mere presence of oxygen in water without these bacteria does not lead to a perceptible diminution of organic matter.
>
> 5. The rapidity of oxidation is influenced by the volume of organic matter present, the temperature of the water, the distance of the run, also whether the stream has a wide surface exposed to the sun and air, the rapidity of the current and the character of the river bed.
>
> The various factors named are calculated to purify the water in our river, provided we give it a chance, but with increasing settlements it is possible that practically here, as elsewhere, the pollution becomes continuous from its source to the reservoirs. The statement of Dr. Tidy and

other chemists who declare that even a flow of even ten or twelve miles is sufficient to free a river of all trace of sewage contamination is no longer credited, especially since the Massachusetts State Board of Health for 1876 reports an outbreak of typhoid fever in a hospital using river water, which was traced to an infected barrack twenty-five miles up the stream.

As we can hardly believe that pollution is tolerated in close proximity to the "intake" of our river water, I submit that the almost constant presence of fæcal bacteria is evidence of some distant source of pollution, and that they have not been destroyed by the agencies which are believed to be all sufficient by the advocates of the theory of "self-purification of streams."

It is the consensus of opinion of those best qualified to judge, that while a stream under favorable conditions undergoes a certain degree of self-purification, we cannot rest satisfied that dangerous contamination does not exist, and such water is unsafe for drinking purposes unless it has been subjected to filtration by means of filtering beds. The effects of a pure water supply upon the decrease of typhoid fever has been abundantly demonstrated in various cities, and the very fact that filtering basins eliminate from ninety to ninety-eight per cent of all germs, is the best indication that they will remove a corresponding number of disease germs. Körösi, of Budapest, has proved by statistics that of seven thousand residents in the most fashionable part of his native city, those who used filtered water contributed $9\frac{5}{8}$ cases per one thousand, while the consumers of unfiltered water furnished $14\frac{1}{8}$ cases per one thousand.

Professor Mallett, of the University* of Virginia, says: "No known poison, in the diluted state, will produce the effects which have been traced to drinking water contaminated with human excreta; in fact, there seems to be no dilution which can make such polluted waters safe. They are the culture fields for the germs of the most deadly diseases, such as cholera, typhoid fever and dysentery."

Dr. Frankland maintains that water once contaminated with excretal sewage, even if purified subsequently by filtration, in the most perfect way attainable, if not positively dangerous, is still unsafe to be used. "There are," he says, "animal organisms existing in sewage matter so minute as not to be seen by the unaided eye, and we have reason to believe that they even exist outside the range of microscopic vision, and possess powers antagonistic to human life."

Dr. Macadam, of Edinburg, a thorough observer, and investigator, says: "The line must be distinctly drawn between non-putrescent organic matter and that which is putrescent. Impregnations from household sewage form the most dreaded contamination, and yield water which, though sparkling and clear, is yet most unwholesome and deadly."

*Report of the National Board of Health.

It is very generally agreed that the discharge directly or indirectly of sewage matter of towns, whether it be excretal, household waste, or factory waste, and however diluted, cannot with safety be allowed to flow into any source of water supply used for dietetic or culinary purposes.

A pure and abundant supply of water is cheap at any price for any community, and "millions" for prevention would be better than "one cent" for cure. This is a question that affects the entire community and not the individual.

Rochard fixes the economic value of an individual at what he has cost his family, the community or the State for his living, development and education. Practically this is a loan from the social capital, until he can restore it by labor. The value of this cost has been fixed at from one thousand to five thousand dollars. Let it be assumed the average is three thousand dollars, every death then of an adult person is the withdrawal of three thousand dollars from the earning power of the community.

Statistics show that nine to twelve per cent of typhoid fever cases are fatal. These cases are mostly among adults, and hence the producing class. Typhoid fever is a water-borne disease. Allen Hazen,* says: "A reduction of the annual death rate by seven will warrant the construction of filter plants when a life is valued at five thousand dollars, and a reduction of seventy will save enough to the community in one year to pay for the construction of a filtering plant."

THE INVESTIGATION OF PUBLIC WATER SUPPLIES.†

One of the most important factors in the prolongation of life and preservation of health in any community is a pure and wholesome water supply. The necessity of measures which enable municipal authorities to secure such water, in quantities to meet all demands, is now fully recognized by every intelligent citizen, who also knows that pure sources of supply can generally be determined only by a thorough and careful investigation. As the population of our country increases the sources of contamination likewise multiply; so year after year it becomes more and more difficult to secure an adequate supply of water for cities and towns that shall be entirely free from dangerous impurity. In mountainous regions, where the conditions for self-purification are most favorable, we generally find the purest waters in great abundance; yet in the Mississippi Valley, where the streams are generally sluggish and frequently heavily laden with organic impurity, and in the Eastern States, where the rivers are sewer-polluted, the problem of securing pure water is difficult, and it is sometimes

*Hazen on "Filtration of Public Water Supplies."

†By Floyd Davis, formerly chemist of the State Board, and presented at the August meeting, 1895.

almost impossible with limited means to furnish a supply that is beyond dispute in its quality.

Many of our cities and towns lie adjacent to public watercourses, from which the water, polluted or otherwise, is pumped through mains, without proper purification, to be drunk by the people. Under such a disregard for sanitary considerations it is not strange that we are still maintaining in some parts of the country a typhoid fever rate higher than that prevailing in any other civilized country. Our typhoid death rate is too frequently many fold what it is in some European cities, like London and Berlin, which have expended millions of dollars to secure for their citizens a pure and wholesome supply of filtered water.

The ideal water for manufacturing and domestic purposes is distilled, and the amount of impurities, both inorganic and organic, found in the natural water is, therefore, a measure of its purity. It is rare that the mineral constituents have any marked effect on the quality of a water for drinking, since the poisonous compounds of barium, iron, zinc, copper, lead and arsenic, which may exist in it, are not often found in sources that are available for the supply of cities and towns, and in the sanitary investigation of a water supply we do not usually look for these substances. But the mineral constituents have a bearing upon the use of a water for boiler and manufacturing purposes. Its suitability for the generation of steam is determined mainly by the amount of lime, magnesia and mineral acids which it may contain, since these bases incrust the boiler and the acids corrode it. Magnesium chloride is especially objectionable. The mineral salts also characterize a water for manufacturing purposes, since a hard water containing much iron is unsuited for the manufacture of starch; a water having much magnesium in it is not desirable in the manufacture of beer, while water for distilleries should be as pure as possible.

These are considerations of importance only for particular purposes, but every public water supply must be used domestically by large numbers of people, and the substances which vitiate it for such purpose are of greatest importance in its sanitary investigation. They are organic, both vegetable and animal, and exist in different proportions in all natural waters that have any communication with the surface of the soil. The manner in which they gain access to water, and their relations to health and disease, have been discussed in a former paper. Suffice it, therefore, to say here that decaying animal matter is indirectly far more dangerous than decaying vegetation, for it is from animal sources that the infectious bacteria, now considered the real agents of disease, are mainly derived. Upon the danger from these various impurities is based our classification of water supplies.

Whenever I am called upon to investigate the water supply of a city, which may include wells and other sources, I generally classify waters under five divisions, as follows:

1. *Excellent waters*, or those which are so pure and free from suspended matter that aëration and filtration would scarcely improve them. Aërated distilled water and the water from some springs in granite regions belong to this class, but it is rare that a chemist has to investigate them.

2. *Permissible waters*, or those which can be used constantly for all domestic purposes, without any danger of injurious effects. They are waters which, however, can be improved by better methods of storage, or by a thorough filtration. Nearly all drinking waters belong to this class.

3. *Suspicious waters*, or those which are liable at any time to produce ill-effects, or to become so polluted by an influx of filth that they may become bad, or even very dangerous. I always recommend that suspicious waters be first thoroughly boiled, and then filtered, before being used for drinking.

4. *Bad waters*, or those which are sufficiently polluted to render them unfit for domestic use. These may not be immediately productive of disease, but I believe that they lower the vitality of the system and render it very susceptible of zymotic infection. On account of the nature of their pollution, common intelligence should prevent us from using them.

5. *Very dangerous waters*, or those which are polluted by direct communication with cesspools or privies, and in which the pollution is of so high a degree that they should be immediately condemned. Such waters are often productive of typhoid fever and other filth diseases.

In passing upon the quality of a public water supply it is, therefore, essential that all water flowing into it which is seriously polluted with sewage should be rejected. There are other waters, not thus polluted, that have a disagreeable taste and odor, and are manifestly unfit for drinking; still, they are sometimes used in public supplies, largely from necessity.

Cisterns and common surface wells are too infrequently used for public purposes to be considered here, and there are few or no apologies for such a supply in any wide-awake town, although from a sanitary standpoint they deserve our most careful consideration. Springs are used as a source of public water supply in many mountainous regions where the topographical conditions are favorable for their utilization, but in other localities ground waters, stored surface waters, rivers, and lakes are generally used. In many parts of Europe several of these waters are introduced into one city, sometimes at great expense. In this country the usual source is the one that is most convenient to adopt, which is somewhat determined by the topographical conditions of the locality. Thus Denver has a delightful water supply furnished by mountain springs and melting snow, supplemented by hundreds of artesian wells; some cities, like Columbus and Des Moines, located near never-failing streams, utilize the ground waters in the adjacent gravel beds; Boston and New York, having no adequate supply of fresh water near by, store in artificial lakes or reservoirs the rainfall on the nearest elevated water shed; some cities, like Cincinnati, St. Louis, and Omaha, situated on rivers, secure their water supply from these natural channels; while other cities, like Cleveland and Chicago, having great lakes at their doors, reach out into these for their waters.

Spring water which flows from subterranean sources is generally pure and wholesome, because from necessity it is free from organic contamination, and, when the springs are remote from the agencies of pollution, their water is certainly our most healthful beverage. It is so much superior to surface water for domestic use that some cities have incurred great expense to introduce it for a public supply, and in some instances have thus freed themselves of much sickness and a high rate of mortality.

Ground water in regions remote from habitations is generally very pure, and, although it may be, and often is, derived from polluted rivers, yet,

owing to its thorough natural filtration, it cannot often be considered unwholesome. Indeed, with the exception of springs and some mountain streams, I consider ground water by far the best general supply for a city, and in the Mississippi valley this can generally be easily obtained. When such water is secured from wells and filtering galleries in beds of gravel above a city, or along a river course some distance from its channel, it is generally clear, sparkling, and nearly free from organic matter. This is especially true when the gravel beds are separated from the surface by an impervious stratum of clay, and the supply of water comes for long distances by filtration from rivers or other inexhaustible sources. Such water owes its purity to sedimentation and thorough filtration, combined with oxidation; for, during the passage of the water from its source to the well or gallery, the suspended decaying organic matter and the bacteria are retained in the soil, while the soluble organic substances are oxidized into harmless inorganic compounds. It is generally superior to artificially purified water, inasmuch as it is rendered pure long before being utilized, while surface water is purified as used.

Stored surface waters, rivers, and lakes may be very similar in their impurities. The former, when gathered on uninhabited water sheds, will contain little else that is harmful than decaying vegetable matter. But rivers are the receptacles of the waste products of the inhabitants of the districts through which they flow, and are sometimes very dangerous to use. When it becomes known that a surface water is in any considerable degree contaminated with the washings of feed-lots and slaughter-houses, the refuse of manufactories, dead and decaying animals, and the drainage filth of many thousand square miles, it should be avoided; and, when it is further contaminated with sewage, or privy and cesspool drainage, or in any way mixed with the waste products of the human body, its use for drinking and cooking should be prohibited, for some of our most dreaded diseases are now traced to such water supplies.

My reason for rejecting all such water as unfit for human use depends also upon two other principles well established in all civilized communities. The first is that common decency causes every intelligent person to rebel against the use of sewage-polluted water, for no one but a savage, or a lowly-organized scavenger, will wilfully devour the urine, excrement, washings, and filth of man and beast. That such filth is actually finding its way into many rivers is beyond dispute, for the many thousand head of cattle and hogs now kept along our western rivers during the feeding season contribute annually an immense amount of filth to these waters. Tramping the clay soil soon renders it impervious to the rains, and consequently nearly all the filth finds its way in rainy seasons through the small streams into these rivers. In time of high water, there is only little sedimentation of these impurities, and they are carried in suspension and solution down to and past the intake of waterworks of cities and towns located below. In time of low water much of the heavier suspended matter settles to the bottom of these rivers, there to decay and pollute the water, or to be washed down the stream at the next fall of rain.

The second principle is that, when a water has once become infested with disease germs, it can never be entirely purified, except by distillation or sanitary filtration. Such germs are liable to be contributed to these

rivers at any time, should a sporadic case or an epidemic of typhoid fever occur in the drainage area above, and the dejections of the patients go into the river. The impurities in these river waters are such as will favor the multiplication and development of germ life, and the living organisms, instead of disappearing, sometimes become more numerous as the rivers are descended. During high water, when there can be no permanent sedimentation, these waters become constantly more impure in their flow down the river; so, in using them as a source of supply, we must expect to be confronted with all the evil effects that can arise from the sewage and filth that go into them.

From whatever source a public water supply is derived, it should be borne in mind that it will not remain constant in purity throughout a whole season, for there are fluctuations depending upon rainfall, temperature, season, vegetable and animal contamination, and communication with other morbific agents. These variations and the probable degree of contamination of the public water supply should be investigated by the health officers, city physician, or other responsible and capable person, who should communicate his results to the people; and these investigations should extend to the surface wells and other sources of water, which the more ignorant and less fortunate classes are often compelled to use. It is a comparatively easy matter for one somewhat skilled in scientific manipulation to make a few qualitative tests that will enable him to determine with considerable accuracy whether or not a given water is badly polluted. For such examination I usually recommend two tests,—one for chlorine and the other for decaying organic matter.

In most parts of the country away from the sea and salt wells the purest ground and surface waters do not contain more chlorine than suffices to give, with a solution of silver nitrate, a faint opalescence. In testing water with this reagent, its action on a sample of known purity near by should be determined, to use as a guide in comparing other waters. And, whenever an experimental sample shows a decided milkiness with this reagent, then sewage contamination is to be suspected, in proportion to the amount of the precipitate; for sewage, dish-water, cesspool drainage, and other similar polluting agencies generally contain much chlorine. This test is also a valuable means of detecting drainage from a privy-vault into a well. It may be made by first determining the degree of opacity produced in the water by this reagent, and then throwing about fifty pounds of salt into the vault, together with several barrels of water. After a few days, again examine the well water with a silver solution, and, if there is a noticeable increase of chlorine, contamination is quite certain, because the salt, which contains this element, has probably washed from the vault into the well. This method of testing gives results which will frequently surprise those unfamiliar with the subject.

Decaying organic matter is never found in appreciable quantity in pure water. If to a glassful of such water a few drops of sulphuric acid and a few drops of a dilute solution of potassium permanganate be added, a permanent pink color is produced; but, if the water contains decaying organic matter, then the pink color becomes fainter and finally disappears. In the hands of an expert this is an important test, but it cannot be relied on with a novice since ferrous sulphate, hydrogen sulphide, and other reducing agents,

sometimes present in water, produce similar results. But, when a water shows an excess of chlorine and bleaches potassium permanganate, it is certainly suspicious, and should be analyzed by an expert. My advice in all cases where persons seek counsel is to make the experiments given above, and, if the results are not satisfactory, to send the water to an experienced chemist, with necessary information regarding its source, and have a thorough analysis made.

The most extensive investigation of the quality of a water supply involves questions of a chemical, microscopical, biological, and physiological character, together with an examination of the surroundings of the source of supply; and in all this much depends upon the judgment and experience of the analyst, for water analysis is certainly among the most delicate of all chemical operations, and its proper interpretation requires great experience. The chemical analysis should determine the present and past pollution of water, and distinguish between vegetable and animal matter; the microscope should reveal floating substances, like fragments of hair, excreta, and other filth derived from surface drainage or sewage, which show at once that the water containing them is loathsome and unfit for domestic use; the bacteriological investigation should be for the purpose of detecting infectious germs, but it is more frequently to determine the number of micro-organisms in a given volume of water; while the physiological test should be made in order to afford opportunity for studying the effect of the water on the lower mammals. Since bacteria are now believed to be the direct or indirect agents of all zymotic diseases, the determination of the conditions favorable for their development, as shown by the chemist, or of their actual existence in water, as shown by the bacteriologist, is the real aim of sanitary water analysis. Without discussing the relative importance of the chemical, microscopical, bacteriological, and physiological examinations, it is only necessary to say here that, whenever a chemical and microscopical analysis reveals an excess of filth or sewage in a water, its use should be discontinued without further investigation: for the time required for a thorough bacteriological analysis renders such too expensive for general use, to say nothing of the common failure to recognize the infectious germs. The most experienced water analysts look more to the chemical and microscopical results than to the bacteriological, because the chemical and microscopical methods of study are highly perfected, while the bacteriological methods are yet in a chaotic state so far as utility is concerned.

It is my opinion that the past history and associations of many waters are often sufficient to condemn them, no matter how free they may seem to be from organic impurity; and it is not always necessary to make a laboratory investigation to condemn some of the polluted ones. Then, too, every analyst knows, or should know, the importance of having a thorough knowledge of the surroundings of the source of supply, before giving an opinion of the quality of a water for drinking; and I believe that no competent chemist will claim that a water high in chlorides and nitrates, although organically quite pure, is good, without a knowledge of the agencies which may pollute it. Inexperienced chemists are in error in sometimes relying wholly, in testing a water, upon the Wanklyn process, which determines the free and albuminoid ammonia, but gives no knowledge of its past history, or of the products of oxidation of its organic matter. Any analyst

who finds a water contaminated beyond a reasonable limit of safety is justified in condemning it; but, because he may fail to find any of the immediate products of decomposition of organic matter, he would not, in my judgment, be warranted in pronouncing such water good, unless he knows that such products have never existed in it; for it frequently happens that a water having direct communication through the soil with cesspools and privies has but little organic matter in it. The same is true when lime is used to disinfect a privy-vault. In all such cases the amount of chlorides and nitrates in the water is excessively high, and generally the total solids and loss on ignition are also large. Still, this is not different from what we often find in good mineral waters, and a chemist who relies solely on his laboratory determinations might claim that such water is good and safely potable, while in fact it may be a most dangerous beverage and badly infested with disease germs. Thus it is that an opinion of the quality of a water should be given only after a careful consideration of the surroundings of the source of supply. More than this, I believe that no chemist should, and no experienced reputable chemist would, venture a *decisive* opinion as to the purity and wholesomeness of a water supply for a city or town without a *personal* inspection of the topography of the surrounding territory. It is unwise, if not impossible, to predicate an opinion upon the investigation and report of inexperienced men, or to determine the present and prospective soil pollution without a personal inspection of the entire drainage area.

England formerly led the world in the investigation of public water supplies, but in recent years Massachusetts has given us classic results in this as well as in the filtration of water; so in this country we are just beginning to realize that pure water, which was once the luxury of the few, is now the necessity and pleasure of the many. The benefits which have resulted from these and other investigations are attested by the healthful development and increased civilization of our race; for it is now admitted by all competent judges that the progress made by the inhabitants of manufacturing towns, in decency, cleanliness, self-respect, and morality, since the introduction of a pure public water supply, is as striking as the improvement in their health, which shows that pure water is a great moral, as well as hygienic, agent.

PROTECT THE RIVERS

This State is laying up wrath against the day of wrath in the neglect to protect the rivers and streams from contamination. Polluted watercourses are a constant menace to public health. It is an erroneous belief that running water purifies itself, especially in the removal or destruction of germs of some of the most formidable diseases which affect the human race. Not only is the surrounding atmosphere poisoned, but fish are poisoned and their decomposing bodies are added to the polluted mess.

The rivers should be kept free from contamination. The Almighty never intended them to become catch-basins of filth and carriers of the sewage of cities and towns. Rather was it that they should be a source of beneficence to mankind in many ways. The time is coming, and not far distant, when a reversal of this policy of neglect will be imperatively demanded.

Already in Iowa serious apprehensions are being aroused on this subject. The city of Waterloo, one of the most progressive in Iowa, lying on both sides of the beautiful Cedar river, is to-day greatly exercised because the river from which she receives her water supply is the receptacle for all the sewage of Cedar Falls, a large and growing city but a few miles above.

It would seem that in the near future either Cedar Falls will have to dispose of her sewage in some other way or Waterloo will be obliged to abandon the present source of water supply.

RAILROADS.

It is gratifying to report that progress is still being made in adopting appliances by railroad companies, for the protection of human life. Not only is this true regarding air-brakes and couplers, but in the sanitary and hygienic construction of cars, in response to an increasing demand of public sentiment. The advancement in this direction is noticeable on all the great through lines. To receive the commendation and approval of the public, for comfort, elegance, heating, lighting and ventilation, is now the ambition of railway managers, and it is upon the preponderance of these features they base their claim for patronage. What was considered good a few years ago, would to-day entirely fail to satisfy the public demand.

The Iowa Railroad Commissioners' report for 1895–6, still continues barren of evidence of compliance with the statute regarding the placing of air-brakes, and automatic couplers on cars used in this State. The statistics respecting accidents, however, indicate an increase in these appliances. The following are casualties for the years named:

	1890.		1891.		1892.		1893		1894		1895.		1896.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Employés	35	442	70	579	69	602	92	696	48	387	47	399	56	431
Passengers	4	30	10	67	5	90	17	78	7	36	7	16	8	62
Others	33	40	69	101	91	95	70	64	90	68	82	74	80	84
Total	72	512	151	747	178	778	177	824	145	491	136	443	136	557
Coupling cars	8	149	14	203	13	242	16	196	7	91	5	66	6	95
Falling from trains	5	44	17	83	23	85	23	69	17	52	30	37	26	53
Overhead obstructions			4	4	3	17			3	5				
Collisions	2	21	10	55	4	26	17	37	5	19	3	6	2	15
Derailments	3	16	5	42	5	10	8	65	3	40	13	29	4	15
At highway crossings	7	7	14	24	1	8	13	19	16	12	13	19	12	12
Trespassing on track							21	25	41	8	21	16	41	22
Caught in frogs							2	6		19		4		
Getting on and off trains							13	49	15	33	10	32	4	37
Stealing rides							10	13	5	6	5	12	12	10
Intoxicated							1	1		1				1
Miscellaneous	51	276	71	462	44	293	83	309	26	204	34	21	27	203
Total	72	513	151	747	178	778	177	824	145	491	136	443	136	557

The report of the Inter-State Commerce Commission for the year ending June 30, 1896, gives the following casualties on all railways in the United States for the years named:

YEAR	EMPLOYES.		PASSENGERS.		OTHER PERSONS.		TOTAL.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1888	1,813	25,020	170	2,078	4,155	5,677	6,138	33,748
1894	1,823	23,455	124	3,014	4,900	5,443	6,847	31,912
1893	2,727	31,729	209	4,229	4,227	5,432	7,163	41,390
1892	2,554	29,267	206	3,597	4,217	5,179	7,147	38,043
1891	2,660	30,140	206	3,972	4,070	4,749	6,736	38,861
1890	2,451	27,396	196	2,425	3,508	4,206	6,155	29,027
1889	2,072	20,028	210	2,146	3,341	4,433	6,023	26,609
1888	2,070	20,148	315	2,138	2,897	5,602	5,282	25,888

The distribution of casualties is as follows, employés being classified as trainmen; switchmen, flagmen, and watchmen; and other employés:

	EMPLOYES.							
	TRAINMEN.		SWITCHMEN, ETC.		OTHER EMPLOYES.		TOTAL.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Coupling cars	160	6,077	90	1,836	113	286	351	4,177
Falling from trains	341	2,343	49	363	90	591	432	3,297
Overhead obstructions	42	244	8	23	9	23	59	343
Collisions	194	742	45	27	27	231	134	12,700
Derailments	136	540	1	36	80	215	192	304
Other train accidents	32	474	3	9	7	51	42	434
At highway crossings	2	17	11	18	4	27	17	87
At stations	30	490	17	86	43	745	93	1,330
Other causes	159	3,130	23	521	167	6,399	568	10,180
Total	1,017	14,748	248	2,933	546	8,015	1,911	29,696

1895.	PASSENGERS.		OTHERS.					
			TRESPASSING		NOT TRESPASSING.		TOTAL.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collisions	8	208	31	24	9	63	40	97
Derailments	17	358	37	41	10	43	47	84
Other train accidents	5	89	41	80	4	30	45	110
At highway crossings	2	14	135	176	272	771	505	947
At stations	31	492	328	496	54	161	376	657
Other causes	106	1,094	1,066	3,532	76	350	3,142	3,782
Total	170	2,375	1,631	4,359	524	1,318	4,155	5,677

The following table shows the number of automatic brakes and couplers applied during the year:

	LOCOMOTIVES.				CARS.			
	AIR BRAKES.		COUPLERS.		AIR BRAKES.		COUPLERS.	
	1894.	1895.	1894.	1895.	1894.	1895.	1894.	1895.
Passenger	9,770	9,876	3,479	3,893	32,403	32,384	31,916	31,971
Freight	15,983	16,772	1,308	2,039	264,484	295,073	317,896	366,985
Switch	3,033	3,038	217	369	....	....	....	....
Unclassified	453	439	139	141	....	....	....	....
In company's service	....	....	....	....	4,466	4,976	2,676	3,438
Total	29,239	30,065	5,123	6,642	301,753	332,433	352,488	402,394
Increase	....	826	....	1,329	....	30,680	....	49,906

From these tables it will be seen that practically all passenger locomotives are supplied with air brakes, yet six thousand one hundred and six remain without automatic couplers; of twenty thousand and twelve freight locomotives three thousand three hundred are without air brakes, and seven thousand nine hundred and seventy-three without automatic couplers. Of the thirty-three thousand one hundred and twelve passenger cars in service, thirty-two thousand three hundred and eighty-four were supplied with air brakes and thirty-one thousand nine hundred and seventy-one with automatic couplers. Of the one million one hundred and ninety-six thousand one hundred and nineteen freight cars in service, only two hundred and ninety-five thousand and seventy-three were supplied with air brakes, and three hundred and sixty-six thousand nine hundred and eighty-six with automatic couplers. It is apparent that much remains to be done to comply with the law which requires all railway equipment to be fitted with these appliances by January, 1898.

A notable feature of these tables is that the increase of these safety appliances does not show a corresponding decrease in casualties among trainmen, for whose benefit they are more especially intended. In Iowa there was one more killed in 1896 than in 1895 and only three less injured. There were also three more persons killed and one hundred and fourteen more injured in 1896 than in 1895. It is quite evident trainmen do not use the appliances provided for their safety.

For the railway service at large the statistics show more favorable results. The following table shows the number of employés, trainmen and passengers for one killed and for one injured in the United States for the year ending June 30, 1895:

YEAR.	NUMBER OF EMPLOYÉS FOR ONE.		NUMBER OF TRAINMEN FOR ONE.		NUMBER OF PASSENGERS FOR ONE.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1895	433	31	155	11	2,084,822	243,661
1894	428	33	156	12	1,668,791	178,210
1893	320	28	115	10	1,985,153	183,929
1892	321	29	113	10	1,491,910	173,831
1891	296	30	104	10	1,917,642	178,594
1890	306	33	105	12	1,727,789	205,164

The following table shows the number of safety brakes and couplers in use on roads in Iowa:

	LOCOMOTIVES.				CARS.			
	AIR BRAKES.		COUPLERS.		AIR BRAKES.		COUPLERS.	
	1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
Passenger and freight	4,341	4,234	.....	.....	....	....	....	....
Passengers	....	....	.....	.....	3,700	4,279	3,200	4,108
Freight	....	....	.....	.....	49,378	52,111	55,702	62,610
Increase	....	....	.....	.....	....	33,372	....	727

Total locomotives in use, 1895, 4,810; in 1896, 5,183.
Total passenger cars in use, 1895, 3,772; in 1896, 4,344.
Total freight cars in use, 1895, 154,672; in 1896, 178,183.

CAR SANITATION.

While advancement is being made to lessen the danger to life and limb of railway employés, sanitarians are agitating reforms for the protection of the millions who travel upon cars. The American Association of Railway Surgeons is doing commendable service in that direction. State Boards of Health are crystalizing their efforts in this behalf, and car sanitation is receiving earnest consideration. It may be confidently

expected that in the not far distant future these houses on wheels—especially the sleeping cars—will be made fit habitations for men and women.

At a late meeting of the American Public Health Association, Dr. P. G. Conn of Concord, N. H., chairman of the committee on "Car Sanitation," concluded his report as follows:

In conclusion, your committee have to add that the *Railway Surgeon*, a journal published in the interest of the National Association of Railway Surgeons, at Chicago, early in 1896, sent out a circular of inquiry to many of the principal railway surgeons of the country, of which the following is a copy, and we append a summary of the answers received as it was recorded by the editor:

1. Is it possible to construct comfortable day coaches and sleepers which can be frequently subjected to efficient disinfection?

2. What modification of the cars at present in use would you suggest?

3. How would you disinfect them, and how often?

4. How would you ventilate them? What would you regard as the most efficient manner of caring for sputum on railway trains?

5. Do you consider the present closet arrangements in cars satisfactory? If not, what changes do the conditions require?

6. What restrictions and regulations should we have in regard to the transportation of patients ill with infectious diseases? Have you any suggestions as to the provisions which should be made for their care *en route*?

7. Do you consider it dangerous to the healthy to travel and sleep in the same car with tuberculous patients? What particular provisions would you make for the transportation of the tuberculous patients? Do you think it preëminently necessary to separate the consumptive people from the healthy? If not, what means would you suggest to prevent infection?

8. How far would you permit a tuberculous patient to travel without rest?

Summarizing the answers we arrive at the following conclusions: There is no question of the possibility of constructing an entirely sanitary car; and it might be that such a car could be made as attractive as those now in use. At the same time the attitude of the public toward such a change in construction is uncertain, and no one can tell, until it has been tried, whether the public would welcome or resent the novelty. In the absence of such a general change in car construction much good can be accomplished (especially on lines running to health resorts) by use of (a) hospital cars in special cases, and (b) cars with compartments for the use of invalids.

Meanwhile, with the existing cars, certain precautionary measures are eminently desirable, which may be stated as follows:

1. All cars should be thoroughly cleaned and disinfected after every run (or at the end of each twenty-four hours on short runs), the use of chemical disinfectants and super-heated steam being the means chiefly recommended.

2. Some efficient system of ventilation of all cars is generally and efficiently needed.

3. Closets should be improved so that the fæcal matter would be retained in some attachment to the closet, under proper conditions, to be deposited at specified places instead of being scattered promiscuously along the line as now.

4. Sputum should be received in cuspidors, in a bichloride solution of mercury and not be allowed to be ejected over the floor and carpets.

The placing of rigid restrictions round the transportation of tuberculous patients is regarded as difficult, but much good might be done by the use of hospital and compartment cars as indicated; and such patients should not, as a general rule, be allowed to travel for long distances at a stretch.

It can readily be seen that this problem is hedged about with many difficulties. To move corporations to a conviction of their humane relation to the public; to awaken, centralize, and direct public sentiment so that it shall demand its rights; and to educate the public in the proper exercise of those rights are some of the important duties of the hour.

As said the immortal Galileo: "*E pur si muove*," "The world moves." Sanitation and hygiene are making rapid pace all over the world.

The transportation company that best conforms to the advancing public demand, and receives its approval, will find in return a reward in dollars and cents that will amply repay for any money or pains expended.

CORPSES.

During the past two years strenuous effort has been made by the several railroad baggage associations and State boards of health to devise and agree upon some method for the transportation of corpses, which should be uniform in operation over all railroads, and in all States. So combined in operation are the railroads in this country, such uniformity of regulations is imperatively demanded. From the outset the Iowa State Board has taken an advanced position respecting the protection of not only train men, but the public generally, from danger in such transportation. Especially was this so respecting the requirement of a permit from the Board for the disinterment of a corpse—a rule which led to some confusion among railroads, in cases where in States having no such rule bodies were disinterred to be transported into, or through Iowa. The question arose as to whether or not the rule did not interfere with inter-state traffic, and it was submitted to the attorney-general, whose opinion will be found on page 42.

At a recent meeting of the National Association of Railroad Baggage Agents, the subject was fully discussed and the following rules were presented and recommended to the several individual associations for adoption. They were also presented to a joint conference of representatives of State and Provincial Boards of Health, General Baggage Agents, and Funeral Directors' Association, and approved. They are as follows:

RULES RECOMMENDED FOR THE TRANSPORTATION OF DEAD BODIES.

Rule 1. The transportion of bodies dead from small-pox, Asiatic cholera, yellow fever, typhus fever or bubonic plague is absolutely prohibited.

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 approved disinfectant fluid (b) disinfecting and stopping of all orifices with absorbent cotton, and (c) washing the body with a disinfectant, all of which must be done by an embalmer holding a certificate as such, approved by the State Board of Health or some other health authority.

After being disinfected as above, such body shall be enveloped in a layer of cotton not less than one inch thick, completely wrapped in a sheet and bandaged, and incased in an air-tight zinc, tin or 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 hermetically soldered, and all enclosed in a strong outside wooden box.

Rule 3. The bodies of those dead from typhus fever, puerperal fever, erysipelas, tuberculosis, measles, or other dangerous communicable diseases other than those specified in Rules One and Two, 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 which 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 Two. But when the body has been prepared for shipment by being thoroughly disinfected by an embalmer holding a certificate as in Rule Two, issued by the State Health authorities, the air-tight sealing may be dispensed with.

Rule 4. The bodies dead of those 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, and provided they reach their destination within thirty hours from the 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 sheet and bandaged, and encased in an air-tight coffin or casket. But when the body has been prepared for shipment by being thoroughly disinfected by an embalmer holding a certificate as in Rule Two, issued by the State health authorities, the air-tight sealing may be dispensed with.

Rule 5. In cases 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 agent 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 Two, 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 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 coroner'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 Two, the name of those authorized by the health authorities to accompany the body. The transit permit must be made in duplicate, and the signature of the physician or coroner, health officer and undertaker must be on both 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 duplicate copy shall be sent to the official in charge of the baggage department of the initial line, and by him to the secretary of the State or Provincial Board of Health of the State or Province from which such 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 the secretary of the State or Provincial Board of Health of the State or Province from which said shipment was made.

Rule 8. Every disinterred body, dead from any disease or cause, shall be treated as infectious or dangerous to the public health, and 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 health 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.

Bodies deposited in receiving vaults will be treated and considered the same as buried bodies.

These rules will come before the several State and Provincial Boards for adoption or revision.

The rules and regulations of the Iowa State Board of Health respecting the transportation of corpses, now in force, and observed by all railway lines operated in Iowa, are printed on page 43.

MINER'S OIL.

Since the state entered upon a systematic supervision of mining for the protection of the lives and health of the miners, the quality of the oil used in miners' lamps has been the subject of more or less criticism of the State Mine Inspectors. It has caused alarm, not only for the health of the miners, but for the safety of the mines.

The smoke thrown off by the lamps is so dense as to hide other elements of danger; retard the flow of the necessary volume of air, and also render even the restricted air unfit for respiration.

Originally the tallow candle was used for lighting purposes; then came lard, both of which were satisfactory. Lard, when pure and made from healthy hogs, has a specific gravity of from twenty-three to twenty-three and one-half degrees; gives a clear, bright light quite free from smoke or offensive odor, but when made from hogs long dead, and offal, partially decomposed, gives an odor very offensive, and highly objectionable for use in mines.

A few years ago cotton seed oil came into market. It proved to be adapted to miners' use and being sold at much less price, soon forced lard almost entirely from use. This oil of Winter weight has a specific gravity of twenty to twenty-two, and congeals at about thirty-two degrees Fah. The Summer weight has a specific gravity of twenty-two to twenty-four, and congeals at forty-five to fifty degrees. The heavy grades burn slowly and generate objectionable quantities of smoke, especially when the seed has been improperly stored, and becomes heated and musty.

Miners soon discovered that this heavy oil could be improved in illuminating by adding mineral oil, which became known as "bung-hole" mixing. Experience proved that mixing could not be successfully accomplished in that way.

The mixing scheme of the miners was quickly seized by refiners and dealers in mineral oil, and an unscrupulous system of adulteration commenced which increased to such proportions as to create alarm, not only regarding the lives of

miners, but of the mines. Ohio and other States commenced a thorough and systematic investigation of the extent of this adulteration, the result of which is given in the official reports of their mining departments. Samples of oil taken in various districts were submitted to inspection and analysis by expert chemists. In one instance of thirty-eight samples tested in Ohio, only eight were found pure. The remainder were adulterated with a mixture of eight to eighty per cent of mineral (kerosene) oil. Some barrels did not contain three gallons of cotton seed oil in the entire contents. The brands on the barrels were no indication of the contents. Barrels made by the same refiner and bearing uniform labels of quality contained different degrees of mixture, the variation being eight to fifty per cent.

The adulteration is limited only by the competition of the trade, and the price becomes the standard rather than the quality.

Not only does this adulteration endanger the health of miners and those employed in mines, but causes the condition of the mine to become dangerous. The miners are also most grossly defrauded in the price paid for oil. Pure cotton seed oil, refined for miner's use is worth forty cents per gallon. So-called miner's oil is sold at twenty-seven to thirty cents to the retail dealer, and by him to the miner at ninety cents to one dollar. The refiner by withdrawing fifteen gallons and substituting for cotton seed oil an equal amount of mineral oil at ten cents a gallon, produces an article that sells at twenty-seven cents, thereby receiving three cents a gallon for compounding.

This oil is retailed to the miners at ninety-five cents per gallon and the profit is thirty dollars per barrel.

In 1892 there was very near a failure of the hog crop of the country, which largely increased the price of lard. In sympathy with this, and the increasing demand in various industries, cotton seed oil rapidly advanced in price thirty-five cents per gallon. This was the opportunity for unscrupulous dealers to increase the compounding and reap the benefit. They even purchased empty barrels bearing the brand and label of the American Cotton Oil Company, and filled them with compounds.

The high price of lard and cotton seed oil in 1892 brought into market an illuminant known as Miner's Sunshine. It is paraffine wax, a residuum of petroleum, a pure mineral product,

and contains about three to four per cent of mineral oil, or sufficient to render it limpid and freely combustible at one hundred and ten degrees Fahrenheit temperature. It burns with a clear, white flame without smoke or odor. It has the advantage that it is not subject to fluctuation in price from failure of the crop, as are lard and cotton seed.

As a rule, miners have no opportunity to purchase oil other than at the mine, or the company's store, at extortionate prices. So grossly pernicious became this traffic, and so injurious the results, that Ohio, Illinois and other States sought to control it by legislation. Iowa, being without protection, was made the dumping ground for adulterated oil in all degrees of sophistication. In 1894 the mine inspectors made an effort to secure legislation thereon, and a bill passed the Senate but failed to receive final action in the House. In 1896 another and successful effort was made, and a law was enacted similar to the Ohio law. The law is as follows:

SECTION 1. That only pure animal or vegetable oil, or paraffine, shall be used for illuminating purposes in any coal mine in this State. If any person, firm or corporation, either by themselves, or agents, or employé, shall sell or offer for sale for illuminating in any coal mine in this State, any adulterated oil, or any mixture or compound oil, he shall be deemed guilty of a misdemeanor, and upon conviction thereof he shall be fined not less than twenty-five dollars nor more than one hundred dollars for each offense.

SEC. 2. If any mine owner, or operator, or employé of such owner or operator, shall knowingly use, or if any mine owner shall knowingly permit to be used for illuminating purposes in any coal mine in this State any adulterated, or mixed, or compound oil, he shall, upon conviction therefor, be fined not less than five dollars nor more than twenty-five dollars for each and every offense.

SEC. 3. It shall be the duty of the State Mine Inspector, whenever he has reason to believe that oil is being used, or sold, or offered for sale in violation of the provisions of this act, to take samples of the same and have them tested or analyzed, and if they are found to be impure he shall make complaint to the county attorney, who shall forthwith commence proceedings against the offender in any court of competent jurisdiction. For the purpose of this act the State Board of Health shall fix a standard of purity of oils and regulations for testing said oil, and said standard and regulations, when so fixed, shall be recognized in all the courts in this State.

SEC. 4. All reasonable expenses incurred in testing or analyzing oil under the provisions of section three of this act, shall be paid by the owner of the oil whenever it shall be found that he is selling or offering to sell impure oil in violation of the provisions of this act. Such costs may be recovered in a civil action, and in criminal prosecutions under this act such expense shall be taxed as part of the costs.

SEC. 5. Nothing in this act shall be held to prevent the use of electric lights in any coal mine in this State.

Under the provisions of this act, the State Board of Health promulgated the following rules:

RULE 1. The specific gravity of oil used for illuminating purposes in coal mines must not exceed twenty-four 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. If the oil to be tested is below forty-five degrees Fahrenheit temperature, it must be slowly heated until it reaches eighty degrees temperature. Should the oil be above forty-five degrees temperature and below sixty degrees, it must be heated to seventy degrees, when in either case, it must be well shaken and allowed to cool gradually to a temperature of sixty degrees, when the test must be made.

RULE 3. In testing the gravity of oil the hydrometer must be, when possible, read from below, and the last line which appears under the surface of the oil shall be regarded as the true reading.

RULE 4. Where the oil is tested in difficult circumstances, an allowance of one-half of one degree may be made for error of parallax.

RULE 5. Paraffine wax shall 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 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. In all cases of doubt, or question as to an inspection, or as to the purity of oil or paraffine to be used in mines, a sample of the same shall be furnished the State Mine Inspector for chemical analysis.

CARE OF OUR INSANE BY COUNTIES.

There has been much discussion in Iowa within the last few years upon the relative merits of State care and county care of the insane, and as a result we have a growing tendency, apparently, in addition to the State hospitals to build new and enlarge the present county hospitals, in connection with the county poor farms.

There is great reason to fear this is not a wise conclusion. It would seem as if the experience and observation of the older States, where this mixed system of State and county treatment has been tried, should count for something.

After an experience and careful observation covering many years the State of New York, in 1890, adopted the system of having the insane wholly cared for by the State. This change has been gradually in progress since then, the last transfer of property and patients being made to the State by the county of New York, March 1, 1896, the transfer by Kings county having been made the year previous. Since March 1st, last, the State has had entire control of all its insane.

A special dispatch to the New York *Tribune*, dated December 20th, ult., from Albany, says: "As showing the effect of this policy two things should be taken into consideration:

"*First.*—The cost of maintaining them.

"*Second.*—Their recovery.

"An examination of the workings of these institutions, which are now consolidated under one responsible head, shows what might naturally have been expected, namely, that the cost of maintaining the institutions has enormously decreased under central management and control, and that the rate of recovery has constantly risen since this control began. Under the enlightened system which now prevails, the best methods, ideas and policies are substituted for the chaos which formerly prevailed."

All these institutions are under the control of a board of superintendents. The growing tendency in Iowa is to have in every county an insane hospital, independent of and in no way responsible to the State, nor to the State institutions for the insane. These county hospitals are under the stewardship of the steward of the county almshouse, and under the professional care of the county physician, who is often inexperienced as a physician and especially ignorant in regard to mental and nervous diseases—who is too often selected because he is the lowest bidder for the place, or because of sympathy for him as a new beginner, or because of some political influence on his own part or on the part of his friends. Would it be surprising that this most unfortunate class of all human beings should under such circumstances be deprived of the temporal, moral and medical care so much needed!

In these State institutions the diversion and employment of the insane to a safe extent receive practical consideration—since extended experience has shown that properly diversified occupation that is healthful in character is highly beneficial and conducive to permanent recovery.

There is not a shadow of doubt that if one of the intelligent superintendents of our State hospitals should visit the best of our county hospitals a condition of deficiencies and faulty administration would confront him that would indeed be shocking.

The following additional excerpt from the article above referred to is appended:

> All of the insane are now receiving the beneficent care provided by the State. All are provided with suitable diet, sufficient in quality and quantity. All are provided with suitable clothing. All are receiving a high grade of medical care, and all are treated with reference to the possibility of their recovery. The old system of setting aside several thousand as being beyond the pale of recovery has been abandoned in favor of the more enlightened one which provides the benefits which only the State can give. The old horrors, abuses, neglect and ill-treatment which prevailed under the county system have entirely disappeared.

Would it not be well for the thoughtful, intelligent people of Iowa to seriously consider this subject? Would it not be better to profit by the experience of these older States and adopt at once the system that experience has taught to be most economical, humane and helpful to recovery, rather than go back to experiments that have been abandoned after years of faithful trial?

If in populous counties with a large number of insane and ample means to erect suitable buildings and to equip and maintain them in a suitable manner, the plan might seem to commend itself; and yet if the county of New York with its great metropolis and Kings county, N. Y., with its city, Brooklyn, found it a failure, it would seem as if experimentation on the part of any county in Iowa were unwise.

Polk county has made the most liberal provision of any in this State. Unless a special superintendent with capable assistants is put in charge of it, and a system of visitation, and in a sense of general supervision, is had by one or more of the superintendents of the State Hospitals for the Insane there is room for grave apprehensions as to the care and treatment of those who are sent there. The superintendent of the poor farm and the county physician if residing in the city would constitute, if the only persons responsible for the care and treatment of the inmates, a management that would in no way commend itself. If in the hospitals now in operation, and in the one being constructed, the unfortunate insane cannot be comfortably cared for, with the most favorable conditions for their health and recovery, the State, and not the counties, should

build others and have all of this class cared for in the best adapted buildings, and by the best qualified specialists that can be obtained regardless of cost.

Attention is called to the following article upon the subject from the *Iowa Medical Journal*, August, 1897.*

An editorial recently appeared in the Des Moines *Leader* on the Polk county insane asylum. The article speaks in glowing terms of the financial benefits which will accrue to the county by caring for its insane in the new building recently erected at the poor farm. It extols the system and recommends its adoption by other counties throughout the State, though the building is barely finished and is untenanted.

The inconsistency of this premature advice reminds one of what was said concerning the committee appointed by the last legislature to investigate the State institutions. It was said, in substance, that these men, some of whom have never made a tour of an insane asylum in their lives, would examine the books, investigate the treatment of the patients, and "suggest methods of improvement to the management"—to men who have devoted nearly a quarter of a century to this work.

This and kindred absurdities simply illustrates the imperfect ideas prevalent in the popular mind of what constitutes efficient and humane care for the insane. It consists of something more than furnishing them with a building in which can be provided food, clothing and a bed.

The only motive which permits the erection of county insane asylums is the money-saving motive. It does not seem that argument is needed to convince even the most ordinary intelligence that the care of insane patients at a county poor farm must of necessity be greatly inferior to that which they now receive.

And have they been receiving too good care? When we apply the question to ourselves or to members of our own household there can be but one answer. This, then, should settle the question as to whether the best obtainable is any too good. The county asylum will doubtless be placed under the management of the poor-farm overseer. His wisdom will direct what has to do with the physical necessities of the patients. He will endeavor to secure for them a general care which will at least be as good as that bestowed upon the poor.

*By Sara A. Kime, M. D., Des Moines, Iowa, formerly assistant physician to the Hospital for the Insane, Independence, Iowa.

It will be no better. It is obvious that the insane patients require a very different management from the other inmates of the farm. Their care is a special one, the necessities of which he cannot conceive nor has he the ability to meet.

The medical attendance will no doubt be furnished by the county doctor, whoever he may chance to be, who is generally inexperienced in the care of the insane. It is no exaggeration to say that the best medical practitioner in the State, I care not from what school nor from how many he may have diplomas, is unfit to direct the management of the insane if he is inexperienced in that line.

But how does the county secure the services of a physician? It is done in almost all cases by a system of bidding which awards the contract to the one who places the lowest estimate upon the value of his services. As a medical practitioner he may be competent or he may not be. He contracts to do the work very much below the usual rates for such services, and furnishes his own medicines and appliances. It is unreasonable to suppose that he will give his first and best care to these patients when his private patrons pay him regular fees. When he is busy with private cases, or is out of town on a trip, the poor patients are often placed in the care of a medical student; the private cases, however, are attended by a brother practitioner.

Every now and then we read of some unfortunate poor patient dying as the result of improper medical attention, or for the lack of any. This condition will of course continue so long as the system of bidding is continued. Out of humanity to the poor the system should be abolished. Cheap pay rarely furnishes anything more than cheap services. When we consider that these insane patients, who have been enjoying the best of care in our State institutions under the charge of such experts as Doctors Gilman, Hill and Hoyt, with the most competent assistants, are to be placed under the espionage of an inexperienced poor-farm overseer and county doctor, is it not time to raise a protest against the further establishment of county insane asylums?

In removing the harmless incurables from the State institutions many patients will be found who are capable, under their existing surroundings, of a good degree of self-control. They now live in the best wards of the asylums, where their presence is a positive benefit to the more recent and acute cases. They are quiet, orderly, and industrious and daily manifest their enjoyment of life in a manner that tends to allay suspicion and dispel discontent from the disturbed minds of their associates. Many of these patients when removed from their present supporting influences lose their self-control and become a menace to their associates, or else lapse into a deplorable dementia. To force such a result upon any of these unfortunates is a crime.

There is little doubt but that Polk county will experience the same results from its institution that Linn county has from theirs.

The asylum is located at the poor farm, five or six miles from Des Moines, where the nearest physician resides. The Cedar Rapids *Times* recently said that poor farms are practically poor houses and ought to be called by that name. It declares that the worst mistake that Linn county ever made was when it put twenty thousand dollars into a county insane asylum. It is located five miles from Marion, where the nearest physician resides, and a large number of insane people are kept in it and given poor care and attention.

Not long ago the Ft. Dodge *Messenger* agitated the question in Webster county. It recommended the building of a county asylum and explained in detail how much such a move would save the county. Other counties will also want the same thing. It is to be hoped the experiments in this line already made will be sufficient to convince the people that it is a certain step backward in the care of the insane, and its extension should not be further recommended.

The State of Iowa cannot afford to save money at the expense of this unfortunate class.

VITAL STATISTICS.

As suggested in the last biennial report, the Twenty-Sixth General Assembly made a radical change in the manner of collecting and making the returns of births and deaths.

Instead of requiring these returns to be made by physicians and midwives to the clerk of the district court they are collected by the assessors. The following is the exact language of the Code:

SECTION 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.

SECTION 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 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 twenty-five hundred and sixty-six; 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.

In accordance with the provisions of these sections the State Board of Health, at the annual meeting held May 5, 1897, adopted the forms for records of births and deaths as shown on page sixty-six of this report.

Time will demonstrate whether the change has been a wise one. If the assessors are faithful in collecting, recording, and returning these data the record will be more correct numerically than under the former law. Even in this particular, however, there will necessarily be many defects as to the births and deaths having occurred during the year, because of changes of residence, especially because of removals from the State. The report however, ought to show the exact number at the time when the assessment was made.

From a professional standpoint and as a basis for sanitary conclusions however, the death reports must always be unreliable because of the inaccuracy with which the causes of death—the names of the diseases—must of necessity be stated.

No argument is needed to demonstrate the advantages of reliable vital statistics. They constitute the basis for practical sanitary investigation; and for the application of proper restrictive and preventive measures. If such statistics showed an undue mortality from any special disease throughout the entire State or in any particular locality, intelligent inquiry could be made as to the cause and the proper remedies could be applied intelligently. After the application of these restrictive measures subsequent statistics from the same localities would demonstrate the efficiency of the methods employed.

In a few years there might thus be demonstrated the particular localities in the State where certain diseases have been, or are, most prevalent, and the type of the disease, whether malignant and fatal in character, or whether mild.

Again, statistics showing accurately, or even approximately the marriages, births and deaths occurring in the State furnish comparisons between the number of births and deaths, and data respecting the number of births to each marriage, that are not only interesting and suggestive, but important.

Michigan has recently enacted a law respecting a registration of *deaths* that went into effect August 29, 1897. The features embraced in this law have been held and expressed by the writer hereof for some years, viz: That no one should be *interred* within the State without a proper certificate, showing name, age, cause of death, etc. The practical operation of the law thus far as shown by the first Bulletin issued is highly satisfactory. It shows returns from over two million sixty-one thousand six hundred and sixteen of the total population of the State, leaving less than seven per cent of the State unreported.

The following sections are from the Michigan law referred to:

SECTION 1. *The People of the State of Michigan enact*, That the body of no person whose death occurs in the State shall be interred, deposited in a vault or tomb or otherwise disposed of, or removed from the township, village or city in which the death occurred, until a permit for burial or removal shall have been properly issued by the clerk of the township, village or city in which the death occurs, who shall be the registrar of deaths: *Provided*, That in cities that have, or shall institute, a system of immediate registration of deaths by the Board of Health, the health officer or Secretary of the Board of Health shall act as registrar of deaths under this act, in lieu of the city clerk, and shall in all respects conform to its provisions.

SEC. 2. Whenever any person shall die, the undertaker, householder, relative, friend, manager of institution, sexton or other person superintending the burial of said deceased person, shall cause a certificate of death to be filled out with all of the personal and family particulars required in section three of this act, and attested by the signature of a relative or some competent person acquainted with the facts. The physician who attended the deceased person during his last illness, shall fill out the medical certificate of cause of death, which death certificate shall be delivered to the registrar within the time designated, if any, by the local board of health. In case of death without the attendance of a physician, or if it shall appear probable that the deceased person came to his death by unlawful or suspicious means, then the registrar shall refer the certificate to the health officer or coroner for immediate investigation and report prior to issuing the permit: *Provided*, That when the health officer is not a physician, and only in such case, the registrar is authorized to insert the facts relating to

the cause of death from statements of relatives or other competent testimony. Upon the presentation of a certificate of death properly filled out and signed, the registrar shall issue a permit for the burial or removal of the body and shall immediately record the death in the register of deaths, numbering all certificates consecutively in the order in which they are received, beginning with No. 1, for the first death that occurs in each year. In deaths from dangerous communicable diseases, burial or removal permits shall be granted by the registrar only in accordance with the rules of the local board of health and of the State Board of Health relating thereto.

These certificates of death are sent by the registrars or clerks directly to the Secretary of State, and are in the following form:

County .....
Township.....
Village.....
City.....

MICHIGAN.

DEPARTMENT OF STATE—DIVISION OF VITAL STATISTICS.

CERTIFICATE AND RECORD OF DEATH.

REGISTERED NO. .....

	MONTH.	DAY.	YEAR.
Full name..... Date of death			189 ..

Place of death..... Ward ... *.....St. Sex... Color ... ..

Single, married, widowed or divorced .....

Age	YEARS.	MONTHS.	DAYS.

If married, age at (first) marriage .....years.

Parent of ....children, of whom .. .are living. Birthplace (State or country) .....

Occupation.....

{Name of father / Maiden name of mother} {Birthplace of father (State or country) / Birthplace of mother (State or country)} .....

Proposed date of burial or removal.....189..

Proposed place of burial.....

Proposed place of removal.....via .....

{Signature of undertaker} {Address of undertaker} .....

CERTIFICATE OF REPORTER.

The personal and family particulars herein given relative to deceased are true to the best of my knowledge and belief. Witness my hand this.....day of ..... 189 ...

(Signature).....

(Address).....

MEDICAL CERTIFICATE OF CAUSE OF DEATH.

I hereby certify that I attended deceased from.....189... to.....189 ..

that I last saw h alive on..... .....189..., that he died on .....189...

about.....o'clock, ...M., and that to the best of my knowledge and belief the CAUSE OF DEATH was as hereunder written:

	DURATION OF EACH CAUSE.
Disease causing death*.....	.....
Immediate cause of death.....	.....
Contributory causes or complications, if any	.....
Post mortem.....	.....

*In case of VIOLENT DEATH, state (1) mode of injury and whether accidental, suicidal or homicidal; (2) what was the nature of the injury and the immediate cause of death; (3) contributory causes or conditions, *e. g.*, septicemia. Also whether amputation was performed, etc.

Witness my hand this ..... day of ..... 189....

{Signature of physician, / health officer or coroner} .....M. D.

(Address) .....

The blank forms for death returns are furnished by the Secretary of State to the various village and city registrars and by them are put into the hands of the undertakers and sextons. The registrar is entitled to a fee of twenty-five cents for each death recorded and reported by him to the Secretary of State—except in cities of ten thousand inhabitants and upward where the registrar receives a salary there is no fee for such report.

These reports are sent monthly to the Secretary of State and he compiles and publishes a bulletin monthly showing: "the mortality of the State in detail, the prevalence of important causes of death, and such other information as shall be of public interest and sanitary value."* The registrar shall also send a transcript monthly to the clerk of his county containing a record of all of the deaths entered upon his register during the preceding calendar month for entry upon the county records of deaths. All certificates of death, local registers, or county records authorized under this act or certified copies thereof shall be *prima facie* evidence in all courts and for all purposes of the facts recorded therein.

The act also imposed suitable penalties for refusal or neglect to comply with its provisions.

The State Board of Health, while having nothing to do with the collection, registration, or publication of the mortuary data of the State, is greatly interested in the statistics thus obtained, because of the great benefits to be derived from a sanitary standpoint.

Iowa, and every State in the Union, will watch the results of this law with interest, and doubtless with profit.

PREVENTION OF BLINDNESS AND CARE OF INFANTS.

Upon the recommendation of the State Board of Health and others interested in the public health, the Twenty-sixth General Assembly enacted chapter fifty-seven, as follows:

AN ACT to Prevent Blindness, and for the Care of Infants Affected With Disease of the Eyes, and to Provide a Penalty for the Violation Thereof.

Be it Enacted by the General Assembly of the State of Iowa:

SECTION 1. Should one or both eyes of an infant become inflamed or swollen, or reddened at any time within two weeks after its birth, it shall

*Extract from Sec. 4. Act above referred to.

be the duty of the midwife, parent, guardian, or nurse, or other person having charge of such infant, to report within six hours after discovery thereof by such person in charge of such infant, to the health officer or some legally qualified medical practitioner of the city, town or district in which the parents of the infant reside, the fact that such inflammation or swelling or redness of the eyes exists.

SEC. 2. It is hereby made the duty of attending physicians and midwives to instruct parents and nurses in regard to the provisions of this act, and the danger of sore eyes in infants.

SEC. 3. Any failure to comply with the provisions of this act shall be punished by a fine not less than twenty-five dollars nor more than one hundred dollars, or imprisonment not to exceed thirty days, or both.

SEC. 4. This act being deemed of immediate importance shall be in force and take effect on and after its publication.

Though recommended by the Code Commissioners for adoption in the new Code for some reason unknown it was omitted. It is reasonable to assume that the subject was not considered in all its relations to the public weal or was accidentally overlooked.

The importance of preventing or at least limiting the number of cases of blindness needs no argument. If it is a fact that every case of blindness is a money loss to the State, it must be true that every case of blindness prevented is a money gain. Hence the effort to prevent this affliction is one of great interest to the political economist as well as to the humanitarian.

On this subject three propositions may be stated:

"*First.*—There is in the United States a rapid increase in the number of the blind.

"*Second.*—A large percentage of the blindness is due to the disease known as purulent ophthalmia of the new born.

"*Third.*—By the use of known methods this could be very materially lessened."

BLINDNESS INCREASING.

In proof of the first proposition the census of the United States for 1880 gives the following:

Total population in the United States in 1870 was thirty-eight million five hundred and eighty-eight thousand three hundred and seventy-one.

Total number of persons blind in the United States in 1870, twenty thousand three hundred and twenty.

The proportion of blind to the entire population in 1870 was therefore one to nineteen hundred.

The total population of the United States in 1880 was fifty million one hundred and fifty-five thousand seven hundred and

eighty-three, showing an increase in ten years of nearly thirty per cent.

The total number of blind persons in the United States in 1880 was forty-eight thousand nine hundred and twenty, showing the rate of increase of blindness for the ten years to have been one hundred and forty-seven per cent.

This shows that the increase of blindness for the ten years given was one hundred and seventeen per cent greater than the increase of population.

The proportion of blind persons to the entire population in 1880 was one to ten hundred and twenty-five instead of one to nineteen hundred as for the year 1870.

These cold figures are eloquent as well as conclusive.

OPHTHALMIA IN THE NEW BORN AS A CAUSE OF BLINDNESS.

In support of the second proposition the following facts are given:

Fuchs found that among three thousand two hundred and four cases of blindness collected from asylums in different parts of Europe $23\frac{4}{5}$ per cent were due to ophthalmia neonatorum. In the New York Institution for the Blind, at Batavia, $23\frac{4}{5}$ per cent of the inmates are there as the result of the same disease.

Horner has shown that among one hundred blind asylums in different countries the variation was from twenty to seventy-nine per cent—average thirty-three per cent.

Haussmann gives the number in the asylum in Copenhagen made blind by this disease eight per cent, in Berlin twenty per cent, in Vienna thirty per cent, in Paris forty-five per cent.

According to the report of the Royal Commission on the Blind, of the English government, published in 1889, thirty per cent of the inmates of the institutions and seven thousand persons in the United Kingdom have lost their sight from this cause. Professor Magnus, of Breslau, finds that less than seventy-two per cent of all who become blind during the first year of life are rendered so by purulent ophthalmia, and shows that of ten thousand children under five years of age $4\frac{8}{10}$ are blinded by this disease. In the blind asylums of Switzerland the proportion who have lost their sight from this disease is twenty-six per cent; in the asylums of Austria, Hungary and Italy about twenty per cent, while in Spain and Belgium it falls to about eleven or twelve per cent. An investigation into the causes of the blindness of one hundred and sixty-seven inmates of the Pennsylvania Institution for the Blind, made by Dr. George C. Harlan, of Philadelphia, developed the fact that fifty-five owed their affliction to purulent ophthalmia, and that more than half of these cases occurred in infancy.

What produces this ophthalmia? It is clearly an infectious disease, and can therefore only occur because the specific poison producing it has come into actual, and more or less prolonged, contact with the conjunctiva.

The disease is caused not only by a secretion from the mother due to gonorrhœa, but may be produced by what is regarded as a simple leucorrhœa; and the infection occurs either during or soon after birth.

If occurring during birth the disease generally manifests itself in the child by redness and puffiness of the eyelids at from the second to the fifth day. It may occur several days later—the infection then being caused by uncleanliness on the part of the hands of, or the sponges or cloths used by the nurse or attendant. Soon after this redness and puffiness appears, if the lids are separated the whole eye-balls will be found bathed in a thick purulent secretion, and unless prompt remedial measures are practiced the sight of the eye is either destroyed or permanently impaired.

MEASURES RECOMMENDED FOR PREVENTING THIS OPHTHALMIA.

The Iowa law above quoted regards the presence of this disease, and the blindness resulting from it, as largely *criminal*. It assumes that the disease, if it does occur, should be promptly recognized and reported, and successfully treated. From the foregoing statement as to the cause, there is indeed no excuse for its existence.

It is a preventable disease, and therefore comes within the purview of legislation for the public good, and the police powers of the State.

LEGISLATIVE SUGGESTIONS.

LOCAL BOARDS OF HEALTH.

There is an ambiguity, indefiniteness and apparent conflict in the provisions of chapter sixteen, title twelve, of the Code which should be removed, and such changes made as will leave no cause for doubt or misunderstanding thereof.

Section five provides that local boards of health "proclaim and establish quarantine against all infectious or contagious diseases dangerous to the public, and maintain and remove the same." It does not declare whether the board shall have authority to do this, or should do so, or whether the mayor or clerk shall do so.

The closing paragraph of the same section provides that the mayor of a city or clerk of a township upon written notice given by any practicing physician of the existence or termination of such disease, may declare or terminate the quarantine, as the case may be.

There is an indefiniteness of expression, if not conflict herein which tends to confusion, and will inevitably result in misunderstanding among local officers. It is also merely directory whereas it should be mandatory. The old law, chapter fifty-nine, laws of 1892, which was substituted for section sixteen, chapter one hundred and fifty-one, laws of 1880, was much better for the purpose intended,—that of suppressing contagious diseases, inasmuch as the original law after faithful trial had been found inefficient and expensive.

This substitute read as follows:

> Upon written notice given by any practicing physician, that small-pox, diphtheria, scarlet fever, or any other contagious disease dangerous to the public health exists in any place, it shall be the duty of the mayor of any incorporated city or town, and the clerk of any district township, forthwith, without other authority, to establish quarantine in such cases * * * and to maintain and remove such quarantine in like manner.

Time is an important factor in suppressing an infectious and contagious disease in a community. A few hours delay may result in the loss of many human lives. In the above given substitute the word "written" should be stricken out.

There is a great tendency for parents and physicians to secrete cases of contagious disease, or to call it by some other name. Suppose a physician refuses to give notice to the proper officers, should the intent and purpose of the statute be frustrated, and the public imperiled? The mayor or township clerk should be directed to act forthwith upon satisfactory evidence that a contagious disease exists in his jurisdiction. If there be a question as to the exact nature of the disease, investigation can be made and if the disease be found not contagious, the quarantine can be released, and no injury is done, whereas, on the contrary, without such summary proceeding irreparable injury may be done, and many lives sacrificed.

Further, under this section five, it is necessary for a local board to be convened in each case of contagious disease within their jurisdiction, in order that the proper order may be made for quarantine, and so decided by the supreme court, which in townships where the members are widely apart, requires lapse

of time, frequent failure, and meanwhile many persons may be exposed to the disease.

This provision also involves a needless and unnecessary expense for frequent meetings of the Board, which is entirely avoided by the provisions of the substitute above quoted.

It is suggested that the Code be so changed as to restore chapter fifty-nine, laws of 1892, with which local boards throughout the State are familiar, and which, in the deliberate opinion of the State Board of Health, is most conducive to the interests of the public health.

Section seven of this chapter provides that upon the appearance of small-pox or other contagious disease the local board of health may or may not remove the sick persons to a separate house, or if they cannot be removed they may remain where they are, and necessary nurses, needful assistance and supplies be furnished, and such provision made as will best preserve the inhabitants against danger. The removal and care of the sick is to be effected by an application to a civil magistrate in the same manner as for the removal of a nuisance, as provided in section six.

The section should be made mandatory. The board should be commanded to act. It is not uncommon that the question of expense of a few dollars outweighs the value of human life.

It is only in rare instances—that of small-pox—that the removal of sick persons is required. They can best be cared for in their homes. The inconsistency, therefore, of requiring the warrant of a civil magistrate as authority to enter upon premises for such public benefaction is plainly apparent.

Section one provides that meetings of the State Board of Health shall be held at the seat of government, and that the Secretary of the Board shall have an office in the Capitol. No provision is made as to what shall be furnished such office of the Secretary. After the word "Capitol," in the last line, should be added the words, "to be furnished with the necessary and suitable furniture, lights and fixtures."

In revising the statute respecting *marriages*, it is provided in section 3145, chapter two, title sixteen, that after the marriage has been solemnized, the officiating minister or magistrate shall make return thereof to the clerk of the district court. No limit of time is fixed for making such return. As the clerks of the district court are required to make return to the State Board of Health on or before the 1st day of June of all marriages, births

and deaths filed in his office "for the year ending December 31st, immediately preceding," it is important that the returns be made to such clerk with some degree of promptness. The limit should be not more than thirty days. The same limit should be fixed in section 3147, instead of ninety days. There is no good reason why the return of the marriage to the clerk of the court cannot be made at the time the certificate of marriage is made for the contracting parties.

INSPECTION OF PETROLEUM PRODUCTS.

Chapter eleven, title twelve, of the Code, provides for the inspection of petroleum products. In section two thousand five hundred and eight it is provided that the lighter products of petroleum at a specific gravity of not less than seventy, nor more than seventy-five degrees, when used in the Welsbach hydro-carbon incandescent lamp, and for street lighting by street lamps, may be used for illuminating purposes.

What was evidently intended as a protective measure, by an unfortunate placement of this proviso, becomes practically null, for the reason that the lighter products of petroleum of the specific gravity required, which is gasoline, cannot be used for street lighting in street lamps, as it would give no light, except a blue Bunsen flame. The real intent and purpose was to apply the specific gravity to what is used in the Welsbach lamp, and this is really unnecessary for the reason that gasoline of any other specific gravity or grade cannot be successfully used in that lamp.

There are three grades of gasoline used for lighting purposes. One has a specific gravity of sixty to sixty-five degrees and containing a certain portion of carbon, which is made for street lighting.

Another grade is of seventy to seventy-four degrees, which is used for heating purposes in ordinary gasoline stoves, and for illuminating purposes in the Welsbach lamp.

Another grade is of eighty to eighty-five degrees gravity, and exceedingly volatile, which is used for generating gas in machines outside of buildings and for making gas for gas engines in propelling machinery.

In all cases there is very little danger of misuse of either, and the supply is regulated by the special demand or use to which it is to be put. It would therefore be well to strike out the words relating to specific gravity. If retained it will

necessarily require an inspection of all the lighter products of petroleum, the furnishing of special apparatus to all inspectors, at considerable expense, and the exercise of unusual expertness. It will also necessitate the formation of special rules by the State Board of Health for the government of inspectors, for all of which there is no adequate compensation, there being no necessity, direct or implied, for the proviso in the statute.

MINERS' OIL.

The provisions of the Code respecting the use of oil for illuminating coal mines, chapter ten, title twelve, require the mine inspectors to inspect the oil used for illuminating mines.

The schemes and devices of unscrupulous refiners and dealers to evade the statute are numerous and subtle, and so long as they can avoid the suspicion of mine inspectors, their traffic is continued and the miners are supplied with cheap, spurious deleterious, and mixed products, at exorbitant prices.

It would be much better to place the inspection of this oil entirely with the oil inspectors, and prohibit the sale or use of any oil for illuminating mines that has not been inspected, and does not bear the brand of approval of such inspector. This would put a stop to all illicit traffic and protect the miners not only from spurious and adulterated oil, but from the extortions practiced by mine operators' stores, which are the agencies of these unscrupulous dealers. See page 331.

TABLE I. METEOROLOGICAL TABLES—COMPARATIVE STATEMENTS.

1892—IOWA CITY—1898.

Elevation above sea level, 645 feet.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).												
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1892	68	77	71	67	57	43	31	23	25	39	50	63	50	4.13	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84
1893	68	74	71	66	54	43	31	23	25	39	50	63	49	4.13	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84
1894	68	74	71	66	54	43	31	23	25	39	50	63	49	4.13	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84
1895	68	74	71	66	54	43	31	23	25	39	50	63	49	4.13	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84
1896	68	74	71	66	54	43	31	23	25	39	50	63	49	4.13	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84
1897	68	74	71	66	54	43	31	23	25	39	50	63	49	4.13	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84
1898	68	74	71	66	54	43	31	23	25	39	50	63	49	4.13	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84	3.84

*Observations were made by Prof. T. S. Parvin.

TABLE II. METEOROLOGICAL TABLES—CONTINUED.

1859—MUSCATINE*—1874.

Elevation above sea level, 539 feet.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1860	69 3	71 7	68 06	54 3	51 3	35 7	17 5	21 3	26 6	42 7	49 6	64 3	47 90	2 66	4 02	2 30	2 76	1 00	2 09	4 09	1 17	0 43	0 55	1 67	1 42	25 10
1861	68 3	69 0	70 1	62 6	50 1	37 0	28 0	13 9	27 1	34 0	47 6	58 7	46 28	0 40	2 70	1 07	9 02	9 16	2 93	2 87	0 28	3 91	2 30	4 40	2 98	46 09
1862	71 8	73 4	69 3	63 4	48 6	38 2	29 3	13 5	13 2	29 0	42 9	59 4	45 91	6 07	3 10	7 30	6 10	2 49	3 29	2 75	0 29	0 38	4 06	5 39	3 66	47 78
1863	62 5	71 5	70 4	61 2	40 0	38 8	77 0	26 0	23 4	31 9	48 3	58 8	41 63	0 21	0 80	2 44	4 44	4 10	4 11	3 55	3 40	3 02	2 58	0 55	4 56	33 76
1864	70 6	76 0	73 0	66 9	47 8	45 8	19 3	15 9	27 4	33 6	46 1	66 2	46 95	5 70	5 00	7 60	2 12	4 55	4 83	1 60	2 10	0 67	5 64	3 97	3 60	47 47
1865	74 9	69 3	72 4	72 6	53 0	42 6	21 0	20 5	31 5	34 3	48 1	61 4	50 30	6 99	7 30	1 55	3 75	6 35	0 25	0 35	0 30	3 15	3 57	9 31	2 72	45 34
1866	67 9	77 1	68 8	59 1	53 1	40 2	23 6	20 7	19 6	31 3	51 2	59 2	47 65	4 76	6 85	6 85	6 58	4 61	1 41	2 34	4 19	0 79	0 83	2 92	1 59	43 37
1867	70 5	73 3	74 7	68 8	54 5	31 6	24 3	17 9	28 3	25 7	47 1	51 9	47 00	3 94	8 94	4 45	4 62	3 06	1 97	0 73	1 26	4 76	1 90	0 95	10 60	42 18
1868	70 8	80 8	69 1	58 8	49 8	38 0	21 7	13 4	25 3	42 7	41 7	61 7	48 11	1 28	6 15	4 67	5 17	0 33	4 38	0 81	0 17	1 51	6 31	4 92	6 20	43 90
1869	66 0	70 9	74 4	63 2	42 7	32 1	25 5	26 0	27 0	30 4	47 1	60 0	47 11	7 43	7 42	11 43	3 09	2 07	3 52	2 40	1 56	2 65	0 43	3 16	4 06	49 11
1870	71 8	78 3	78 9	67 8	53 2	39 3	24 4	22 1	24 9	30 8	53 5	65 5	50 20	1 30	1 85	5 83	6 97	3 16	0 44	0 25	2 20	0 23	2 59	0 25	3 00	28 10
1871	70 5	71 3	73 8	60 1	53 8	29 0	15 6	22 1	26 2	42 3	....	65 9	.....	9 16	5 56	5 25	0 00	5 51	3 77	2 13	1 51	3 10	5 36	3 30	2 00	66 63
1872	70 5	74 0	73 8	62 9	48 1	27 3	12 6	16 9	23 2	28 3	48 8	58 6	43 75	7 29	5 85	9 55	6 29	0 80	1 21	0 71	.....	0 24	.....	.....	7 82	.....
1873	73 5	73 5	74 8	61 1	44 9	31 4	25 1	10 4	16 4	31 5	44 2	56 2	45 25	4 44	3 24	0 65	2 97	2 90	0 82	4 29	.....	.30	.....	.....	5 55	.....
1874	.....	.....	.....	.....	.....	.....	.....	.....	.....	42 3	52 1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Observations were made by Prof. T. S. Parvin.

TABLE III. METEOROLOGICAL TABLES—CONTINUED.

1885—CEDAR RAPIDS—1897.

Elevation above sea level, 736 feet.

YEAR	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1885	67 56	93 92	66 15	58 29	45 04	35 55	22 07	7 41	10 06	28 07	45 21	55 58	44 68	3 45	6 43	6 38	2 84	2 50	0 65	2 48	1 65	1 85	0 61	7 82	5 62	42 26
1886	71 11	77 75	78 52	64 10	53 58	32 55	16 50	10 80	21 66	28 70	51 54	62 50	47 48	1 25	0 57	1 70	2 86	4 92	1 50	0 40	2 60	1 27	4 47	2 16	2 69	26 39
1887	74 08	77 80	72 40	63 30	45 51	34 25	22 70	13 52	16 03	31 15	49 52	66 27	45 59	2 53	4 58	1 40	4 93	2 07	0 79	2 72	2 05	4 67	3 50	0 98	1 30	31 41
1888	69 80	75 96	68 10	58 60	47 80	36 50	28 80	9 18	20 60	27 80	48 55	52 83	45 56	2 29	6 03	2 42	1 07	2 35	4 12	2 16	1 30	1 37	8 52	1 74	8 10	36 56
1889	65 27	74 30	71 20	60 66	46 74	35 08	38 42	22 40	19 96	39 30	47 80	57 59	48 21	4 11	5 79	1 65	3 70	1 49	1 03	1 62	1 44	0 42	2 91	5 15	5 15	31 18
1890	74 33	75 53	67 83	59 56	46 18	39 30	29 10	25 32	28 72	29 04	52 25	60 62	48 79	9 54	1 97	4 27	2 90	5 30	1 87	0 40	2 11	1 04	2 04	2 42	2 06	35 65
1891	69 27	70 42	69 82	67 63	49 13	35 21	32 75	28 00	23 27	28 08	51 82	71 51	48 40	3 21	3 20	5 44	1 81	2 44	2 98	1 77	1 89	1 13	3 74	1 63	4 11	35 25
1892	71 03	73 07	75 04	67 04	55 06	32 06	19 07	15 02	30 03	32 95	46 06	55 93	48 00	7 48	4 45	2 07	2 25	1 63	1 60	2 03	2 82	2 18	2 58	4 15	10 12	42 63
1893	72 30	76 03	70 02	64 09	52 07	34 03	32 09	9 03	17 04	33 01	45 09	57 02	46 04	4 99	1 98	2 47	2 85	2 61	1 24	2 40	0 72	1 82	2 99	3 99	2 79	30 67
1894	74 04	76 01	74 07	65 03	52 02	34 00	32 06	21 09	30 09	42 05	52 02	61 08	50 38	2 43	0 18	2 51	1 48	2 23	1 53	1 39	1 51	1 58	4 53	1 65	3 08	25 69
1895	72 06	74 03	75 00	70 00	46 00	35 00	27 00	14 08	16 08	36 00	53 08	63 00	48 08	2 23	3 22	1 50	4 64	1 23	1 83	2 90	1 56	0 58	0 60	1 26	2 84	23 39
1896	73 02	78 02	73 08	59 01	47 06	31 07	30 03	25 00	26 08	33 07	59 02	69 08	51 03	1 91	6 59	2 40	3 18	2 76	1 61	0 85	0 27	0 48	0 50	5 23	3 99	35 77
1897	68 60	76 40	.....	.....	.....	.....	.....	17 01	24 05	32 07	47 04	58 00	.....	3 96	4 35	.....	.....	.....	.....	.....	1 99	0 71	1 13	5 97	2 10	.....

TABLE IV. METEOROLOGICAL TABLES—CONTINUED.

1874—DAVENPORT—1887.

Lat., 41° 30' N.; Long., 90° 20' W. Elevation above sea level, 535 feet.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1874	72.6	77.5	74.3	65.1	52.3	36.3	27.9	23.8	25.9	34.3	41.2	64.3	49.63	5.37	3.10	3.68	7.86	1.30	2.47	0.50	4.34	0.74	1.34	3.64	3.45	38.79
1875	68.4	73.6	69.3	61.7	48.6	33.4	34.5	9.4	10.4	30.1	45.7	60.5	44.96	4.91	9.36	1.73	4.05	1.63	0.57	3.08	0.38	1.09	0.88	2.30	2.01	27.99
1876	69.0	75.4	74.6	62.5	49.2	35.2	14.4	29.9	30.1	32.1	50.0	62.1	49.30	4.25	4.82	4.27	5.50	1.54	2.54	0.36	3.47	3.63	4.34	5.39	6.70	46.89
1877	69.1	75.0	72.5	67.1	53.5	37.1	42.5	16.8	26.3	28.7	49.4	61.6	50.36	5.80	3.42	2.21	1.45	4.88	2.53	2.32	1.41	0.70	3.91	3.28	2.82	35.09
1878	68.0	78.0	74.0	65.1	51.8	42.3	23.9	30.1	29.7	48.2	50.7	57.5	52.21	4.36	2.10	5.07	1.83	4.21	6.90	0.98	0.36	1.00	2.21	2.89	5.14	31.15
1879	69.5	76.9	71.7	69.5	59.8	39.9	30.8	18.4	25.5	39.5	50.5	62.8	50.56	4.57	5.87	5.93	1.43	0.92	4.70	1.02	0.75	1.09	1.80	1.84	5.82	39.86
1880	72.2	84.5	74.5	62.8	50.7	39.7	21.7	37.6	33.7	37.0	49.7	67.2	51.05	7.21	4.31	5.99	4.87	0.94	1.23	1.15	3.13	1.72	2.68	4.50	5.09	43.73
1881	69.7	77.6	77.2	69.7	56.5	39.7	38.2	13.8	19.9	28.8	44.6	69.0	50.29	7.94	6.91	0.73	5.59	6.85	2.19	1.71	1.34	4.14	3.33	1.51	1.34	37.68
1882	64.6	70.5	72.2	64.4	57.7	42.2	18.2	28.9	40.3	40.3	51.3	55.6	51.76	8.53	4.41	2.29	1.30	3.75	1.49	1.78	0.90	0.62	2.86	3.15	5.49	38.50
1883	68.3	73.7	69.8	60.9	50.9	41.7	31.3	15.5	24.4	34.7	51.7	57.0	48.32	4.48	2.66	1.02	0.72	5.13	3.58	6.79	1.16	4.43	0.73	3.33	5.46	39.39
1884	70.2	71.8	70.0	69.5	57.2	40.3	25.1	18.8	26.9	36.4	50.4	61.2	48.72	3.67	4.51	3.84	4.79	7.17	1.49	3.68	0.75	0.98	3.97	0.77	3.79	38.11
1885	68.2	75.5	67.9	66.1	48.1	38.1	25.6	15.9	17.3	34.3	49.4	57.8	45.01	2.08	1.86	12.64	4.19	2.71	1.20	1.95	2.10	1.20	0.17	2.47	1.96	34.55
1886	70.2	76.3	74.4	65.4	55.7	36.1	17.5	13.8	23.4	33.0	52.0	62.4	47.90	0.49	0.43	2.67	2.43	3.47	0.74	0.53	2.22	1.52	3.08	1.84	3.73	22.62
1887	73.0	76.0	72.2	64.4	47.6	37.0	24.0	13.2	23.8	34.3	52.3	67.1	48.90	1.43	4.87	3.23	5.45	3.41	1.13	3.26	1.43	4.87	0.77	1.17	1.76	32.78
1888	69.6	74.4	69.6	58.0	46.9	38.1	30.5	9.7	20.8	30.1	49.5	55.2	46.29	3.83	7.31	2.79	1.28	2.81	3.54	2.59	1.54	1.17	2.10	1.57	9.23	40.46
1889	68.7	73.8	72.1	62.8	49.0	36.6	30.6	28.2	19.0	39.3	49.7	59.3	48.67	5.59	8.35	1.11	3.27	1.26	2.17	1.60	0.95	1.44	1.74	3.89	6.34	37.61
1890	74.0	76.0	70.0	61.8	52.0	42.0	30.4	27.0	31.0	30.0	53.0	58.0	49.68	4.51	0.85	1.66	2.34	3.63	1.37	0.62	2.49	1.10	2.34	0.96	4.33	24.50
1891	71.0	69.0	70.0	60.7	51.0	32.0	35.0	28.0	28.0	29.0	52.0	58.0	49.00	3.56	3.29	6.54	1.50	1.37	3.56	1.64	2.38	0.89	1.08	3.30	2.74	30.95
1892	70.0	74.0	73.0	66.0	56.0	33.0	29.4	17.0	24.0	34.0	47.0	56.0	48.10	10.79	4.16	1.83	2.09	0.55	2.01	2.73	1.60	1.38	3.06	5.41	8.84	44.15
1893	72.0	77.0	73.0	66.0	55.0	36.0	24.0	9.0	17.0	31.0	47.0	58.0	47.04	3.82	1.75	1.19	3.36	0.30	3.56	1.67	1.14	1.69	2.25	4.50	2.67	27.23
1894	75.0	77.0	75.0	67.0	54.0	34.0	32.0	24.0	22.0	43.0	53.0	61.0	51.08	2.16	0.44	2.02	1.02	3.02	1.28	0.61	1.33	4.48	1.88	1.57	1.93	19.52
1895	73.0	79.0	75.0	69.0	48.0	35.0	27.0	15.0	15.0	35.0	53.0	63.0	48.08	1.22	5.16	4.79	1.30	0.81	2.50	2.54	1.27	0.38	1.57	0.52	2.25	27.14
1896	70.7	74.6	73.1	60.6	49.8	35.8	22.8	26.6	26.7	33.0	57.1	68.4	50.08	2.28	5.64	3.12	3.98	1.67	0.69	0.65	0.89	1.45	0.84	3.41	4.03	28.68
1897	70.0	70.4						20.8	28.0	25.2	49.0	59.6		1.87	3.21						3.58	1.57	2.82	3.69	1.91	

TABLE V. METEOROLOGICAL TABLES—CONTINUED.

1878—DES MOINES—1897.

Lat., 41° 35' N.; Long., 90° 40' W. Elevation above sea level, 849 feet.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1878			78.0	68.1	50.4	42.2	19.9																		
1879	70.1	77.7	72.4	60.4	59.7	39.3	31.4	18.7	29.9	39.9	51.2	64.2	51.32	6.69	0.29	1.95	2.79	3.15	5.49	1.38	0.69	1.69	1.69	1.93	4.74	32.00
1880	71.9	74.4	73.1	62.2	49.2	38.2	29.1	28.2	26.0	28.0	50.5	59.5	51.01	4.11	2.22	5.09	0.94	4.90	1.97	0.86	0.72	0.70	0.79	1.56	5.84	37.20
1881	70.6	78.2	77.9	64.2	54.7	35.8	35.0	14.0	28.0	28.9	48.4	66.8	49.86	10.79	5.52	5.29	4.79	6.45	3.97	1.85	1.35	1.78	1.78	2.36	2.82	55.91
1882	67.9	69.4	71.1	64.2	55.4	39.4	23.9	26.7	37.8	37.8	51.1	54.8	52.36	12.16	4.78	3.14	0.15	5.94	2.81	2.50	0.63	2.29	3.28	3.47	3.53	48.67
1883	67.5	73.6	70.7	59.8	48.7	40.7	27.3	8.6	19.1	32.9	51.8	55.8	46.93	7.75	2.37	2.83	1.88	4.42	4.41	1.08	1.72	2.51	0.57	3.49	9.76	41.79
1884	70.0	71.9	68.7	67.9	55.6	37.6	19.4	16.0	21.5	33.8	41.7	59.5	46.96	3.64	2.16	3.84	5.46	5.53	1.56	1.53	0.85	0.64	2.24	2.97	3.38	34.26
1885	69.0	75.9	68.7	63.5	48.6	39.3	28.4	11.5	14.6	36.6	49.0	59.1	46.65	5.09	0.55	5.10	4.82	4.17	0.61	1.96	1.00	0.42	0.94	3.02	1.70	35.62
1886	71.3	78.4	76.8	65.1	57.3	35.8	19.2	10.9	24.8	34.9	52.7	64.4	49.67	1.21	0.27	1.10	7.90	2.02	1.86	0.81	3.44	0.82	1.41	4.32	3.71	29.17
1887	73.9	77.5	72.4	63.8	48.4	37.3	32.9	13.5	19.4	35.7	52.5	65.7	48.25	2.35	1.97	2.66	5.38	1.40	0.82	1.41	0.83	1.65	1.79	2.48	2.31	24.93
1888	68.6	73.6	69.2	58.3	46.8	35.8	29.1	6.9	22.6	29.0	51.0	54.5	45.61	2.32	3.42	4.52a	0.43	0.84	2.09	2.44	1.15	1.51	3.09	1.45	7.84	31.15
1889	67.4	73.5	72.0	62.8	49.2	36.4	29.5	21.8	19.6	39.2	50.1	60.5	49.22	2.22	4.37	2.25	3.41	0.52	1.29	0.57	1.22	0.27	0.11	2.69	4.84	24.13
1890	73.1	76.9	69.6	61.6	51.5	41.2	32.3	20.6	27.0	29.6	52.8	58.4	49.50	4.91	1.10	3.35	1.57	4.46	0.74	0.11	2.64	1.17	0.91	0.78	3.00	25.12
1891	69.2	69.6	69.8	68.2	52.2	32.9	34.6	28.2	29.2	29.8	52.0	57.8	48.73	5.60	2.78	4.23	1.64	3.41	1.24	1.54	1.82	1.13	2.25	2.12	2.29	30.14
1892	69.0	73.8	72.0	65.8	56.2	36.7	19.6	17.8	29.0	33.6	47.0	54.8	47.85	3.41	3.64	2.45	1.42	2.54	1.58	1.95	1.60	1.35	2.47	3.06	5.77	33.24
1893	71.0	76.0	70.0	66.0	55.0	36.0	25.0	10.2	17.0	33.0	46.0	57.0	47.30	4.69	2.56	1.60	4.35	0.27	1.53	1.39	0.56	1.28	1.15	5.61	2.54	29.38
1894	74.0	78.0	76.0	67.0	54.0	34.0	33.0	21.0	20.0	43.0	53.0	62.0	51.00	1.67	0.29	1.89	4.46	2.24	0.99	1.15	1.09	1.39	1.78	1.79	1.41	19.86
1895	76.0	79.0	74.0	69.0	48.0	36.0	27.0	17.0	19.0	36.0	55.0	63.0	48.08	3.26	3.10	2.57	3.20	0.29	0.85	1.86	1.26	0.68	0.50	3.41	2.86	25.31
1896	70.1	73.0	73.0	60.0	51.6	35.0	34.6	25.0	30.0	32.0	56.0	66.5	50.08	2.69	8.15	5.49	3.61	2.69	1.01	0.35	0.60	0.79	1.24	3.47	6.50	35.99
1897	70.1	76.5						20.0	20.0	35.0	49.0	60.0		2.13	2.98						2.08	0.71	2.13	7.97	2.31	

TABLES VI. METEOROLOGICAL TABLES—CONTINUED.

1874—DUBUQUE—1897.

Lat., 42° 30′ N.; Long., 90° 35′ W. Elevation above sea level, 665 feet.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1874	72 5	78 3	74 3	65 2	52 0	34 4	29 6	21 2	23 2	33 2	41 3	65 2	49 86	3 30	3 34	2 13	7 68	2 14	4 17	0 65	2 45	0 36	1 28	1 54	1 08	30 12
1875	67 5	73 3	69 7	61 7	52 1	43 7	33 9	6 6	6 1	27 5	45 0	60 7	44 85	4 75	5 39	1 07	6 11	2 71	0 48	2 71	1 00	2 12	1 45	2 71	3 62	35 12
1876	69 1	74 9	73 8	61 4	47 0	34 1	13 7	27 8	27 8	31 0	48 6	61 6	47 61	7 88	8 15	5 92	5 00	1 10	2 49	0 92	3 20	1 53	4 00	3 03	5 96	50 28
1877	67 4	74 7	75 0	60 2	51 7	35 0	46 0	15 2	24 8	37 1	49 7	62 2	50 15	6 75	2 90	3 98	0 67	5 35	1 31	2 10	0 96	0 26	4 53	3 74	3 84	38 09
1878	66 8	76 8	76 7	63 8	49 8	38 7	19 5	27 7	26 3	45 4	55 6	66 0	50 60	4 15	6 71	1 72	6 94	2 85	0 76	1 12	0 40	0 93	2 44	4 04	4 61	38 23
1879	68 9	76 0	71 6	59 4	48 7	37 4	20 3	17 4	22 8	37 2	50 7	62 6	48 61	4 99	6 78	2 43	2 98	0 93	5 41	1 28	0 44	1 00	1 30	1 03	2 94	32 51
1880	71 1	74 2	72 8	61 2	48 7	37 8	19 1	34 4	29 1	35 6	48 8	67 4	49 76	6 02	3 55	7 15	6 84	0 66	2 11	1 25	1 95	1 01	2 55	3 52	3 72	31 54
1881	67 6	73 2	74 5	66 3	53 3	36 2	34 7	12 5	29 1	30 4	45 9	67 7	48 53	7 56	10 53	2 46	10 26	6 79	3 19	1 50	1 87	3 70	3 70	1 30	2 20	42 40
1882	67 2	69 0	71 8	62 8	55 3	39 2	23 4	24 1	35 7	37 0	48 5	54 4	49 00	6 29	1 48	2 29	2 60	5 29	1 55	1 79	0 84	0 59	1 49	4 47	4 16	41 15
1883	67 7	69 0	67 1	58 5	53 3	39 5	27 0	19 2	18 8	30 9	49 7	54 8	45 62	5 34	7 90	2 70	2 09	4 44	1 65	1 88	1 59	2 60	0 92	1 93	7 10	39 65
1884	68 6	80 0	68 4	67 8	53 6	36 3	21 3	14 1	22 2	32 2	48 4	60 6	46 96	4 89	5 30	4 25	4 07	4 16	1 43	4 08	0 99	2 19	3 85	2 77	4 88	31 98
1885	69 0	73 9	68 8	63 5	55 1	39 2	28 4	12 3	13 3	30 3	47 3	56 7	46 69	6 16	6 16	8 07	4 58	2 30	0 64	3 14	1 80	0 72	0 41	3 69	2 62	34 41
1886	71 3	78 4	76 8	65 1	48 8	35 8	19 2	10 9	21 8	31 3	51 0	61 1	48 70	0 71	0 89	0 67	2 10	4 08	1 80	1 03	3 17	1 16	4 32	2 13	4 17	29 66
1887	71 9	77 5	73 2	71 0	46 3	33 0	32 9	11 5	20 7	32 4	50 7	60 6	49 50	1 82	2 44	4 49	7 72	2 22	0 74	3 07	3 33	3 56	1 80	1 27	2 53	32 50
1888	69 0	74 1	69 0	57 0	46 0	37 0	29 0	7 0	18 0	29 7	48 0	63 9	44 55	5 28	3 59	1 73	2 01	1 62	2 75	1 96	1 20	1 31	3 44	2 58	5 81	32 91
1889	66 0	72 0	72 0	63 0	48 0	35 0	37 0	22 0	16 0	30 0	49 0	59 0	49 08	3 87	4 22	0 26	1 54	0 66	1 51	1 38	1 55	1 34	0 30	3 56	4 00	24 18
1890	74 0	75 0	68 8	60 0	51 0	39 0	27 0	23 0	28 0	31 0	50 0	56 0	48 42	9 50	1 21	8 00	3 72	6 43	1 85	0 82	2 31	1 25	1 58	2 94	5 36	40 36
1891	70 0	69 0	70 2	60 0	54 1	36 6	35 0	26 8	32 1	27 7	50 8	58 2	48 10	2 24	4 59	3 31	0 68	2 30	3 24	2 08	1 27	0 98	2 69	1 63	2 54	26 55
1892	68 0	74 2	72 6	64 2	54 6	31 4	17 9	14 6	28 6	31 0	45 7	55 0	47 40	14 16	5 08	2 51	3 79	0 44	1 89	2 08	2 34	1 02	1 91	4 37	9 18	60 60
1893	73 0	76 0	74 0	63 0	54 6	32 6	22 0	6 6	15 0	32 0	45 0	57 0	45 68	5 49	5 57	0 58	3 31	1 66	2 03	1 33	1 60	1 30	2 53	4 32	3 06	32 77
1894	75 0	76 0	73 0	66 0	52 0	32 0	32 0	22 0	23 0	41 0	52 0	62 0	50 30	2 25	0 02	1 38	2 56	1 39	1 53	0 35	1 11	1 22	3 06	2 28	1 75	19 28
1895	72 7	74 0	74 0	70 0	48 0	36 0	28 0	14 0	16 9	35 5	53 9	62 1	48 70	2 23	3 00	1 75	2 06	0 80	2 12	2 75	1 44	0 66	0 99	0 49	2 63	19 74
1896	71 0	73 3	72 6	59 6	47 48	32 09	30 5	24 0	27 1	31 1	54 7	68 2	49 60	3 11	7 72	2 05	5 67	2 56	1 60	0 71	0 75	1 93	0 76	7 80	7 63	42 28
1897	68 2	76 0						17 09	24 9	32 4	47 6	58 7		2 36	4 34						2 55	1 43	2 97	3 39	2 09	

TABLE VII. METEOROLOGICAL TABLES—CONTINUED.

1874—KEOKUK—1897.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1874	75 5	80 6	76 7	67 0	55 4	36 7	31 2	27 7	29 4	38 0	44 0	66 7	51 20	4 01	4 61	3 87	7 92	1 84	2 17	1 26	3 92	0 88	0 14	2 40	1 65	34 77
1875	71 0	76 5	70 3	63 8	50 6	35 1	6 5	16 3	18 1	33 8	48 9	61 8	48 50	8 32	12 70	3 83	5 30	3 71	0 59	3 93	0 61	1 84	1 07	0 89	6 70	48 19
1876	69 7	78 4	75 8	64 4	51 8	36 2	19 8	23 8	24 2	31 6	50 6	63 5	50 31	6 61	6 79	4 13	11 08	2 12	2 82	0 73	3 68	1 45	3 45	4 07	5 29	51 73
1877	71 4	76 9	74 3	69 8	55 3	38 9	43 9	22 0	38 0	39 5	50 7	63 1	52 06	7 92	6 40	2 52	3 61	7 01	3 05	3 90	0 51	0 15	2 76	4 22	3 55	49 19
1878	70 6	81 5	77 7	67 5	51 3	44 0	23 8	34 9	38 4	50 4	58 8	66 2	55 17	5 93	2 37	5 37	1 36	2 81	1 93	1 95	0 16	2 95	3 78	3 31	3 47	31 78
1879	72 1	80 6	75 0	62 0	51 4	42 7	26 9	24 6	29 8	42 8	53 2	66 8	52 00	2 43	1 98	4 57	1 12	0 28	5 91	1 45	0 50	0 52	1 72	1 55	1 48	32 51
1880	73 5	77 5	75 4	64 4	51 2	37 1	21 3	36 3	30 0	38 8	53 8	69 0	53 46	3 06	2 25	3 81	2 91	2 62	1 13	0 61	2 91	1 94	1 83	4 79	3 92	34 94
1881	72 7	79 9	79 2	72 4	57 0	39 6	37 6	18 8	34 9	33 7	46 8	69 8	51 95	5 70	9 26	3 61	2 59	1 79	0 90	2 58	2 42	2 80	6 65	6 45	42 49
1882	71 1	72 4	73 4	66 1	58 6	42 8	27 7	28 1	39 5	41 7	53 7	56 8	52 54	9 44	4 53	3 99	3 02	2 71	2 25	1 75	1 07	1 54	3 09	3 32	7 11	41 52
1883	69 7	76 0	71 2	62 7	51 5	42 8	31 8	15 5	24 9	35 9	54 0	59 8	49 00	5 88	3 15	1 34	1 70	6 95	2 09	1 39	1 24	0 13	1 07	2 97	4 87	38 65
1884	71 3	79 0	72 0	71 1	56 4	40 8	29 0	18 7	27 5	37 3	50 6	62 3	50 06	4 03	2 30	2 74	4 25	3 35	1 73	3 91	0 85	1 88	3 37	1 31	3 16	31 58
1885	70 4	78 5	76 0	64 6	49 4	40 6	26 7	16 4	34 7	40 7	50 6	63 1	51 07	5 97	7 22	5 98	3 77	2 59	0 88	1 56	2 44	1 74	0 17	3 62	2 93	34 11
1886	76 7	77 5	77 1	68 2	57 6	38 5	21 3	14 7	29 2	36 5	53 6	64 1	49 61	2 86	0 65	5 90	3 04	2 38	1 15	1 03	2 08	1 40	2 25	1 85	4 49	29 66
1887	73 6	79 1	74 1	65 9	50 0	40 5	27 3	19 1	29 5	38 4	53 6	66 5	51 40	1 14	1 57	2 58	3 13	1 98	1 18	2 73	1 48	3 19	0 76	1 84	2 54	26 92
1888	70 3	75 7	70 5	60 0	48 6	39 2	32 2	13 6	25 7	34 2	53 2	58 0	48 39	5 42	6 00	2 07	2 13	1 62	2 85	1 61	1 57	2 17	2 43	1 85	5 08	34 30
1889	70 3	74 4	73 2	64 0	56 3	37 6	37 0	24 5	41 2	32 1	50 7	61 2	51 32	2 97	6 78	0 36	2 14	2 91	1 80	1 68	1 69	0 96	1 68	2 62	4 56	34 79
1890	76 4	78 0	74 2	62 7	54 0	44 0	30 8	28 9	32 8	37 6	54 0	60 1	52 45	3 41	2 69	1 77	4 46	2 44	1 97	0 63	1 81	1 09	2 43	1 79	3 34	26 97
1891	71 5	79 6	74 1	70 9	54 5	35 5	37 9	31 6	29 7	31 1	54 0	63 5	51 74	3 66	2 77	5 10	0 49	1 49	3 69	1 39	2 59	1 32	2 57	5 68	2 56	33 15
1892	73 0	74 6	74 8	67 2	57 2	36 4	25 9	19 6	33 6	36 3	49 3	56 1	50 48	2 50	6 18	1 97	3 21	0 71	3 18	1 50	1 93	1 61	2 91	6 15	6 34	37 45
1893	73 0	78 0	73 0	64 0	51 0	39 0	29 0	14 3	21 3	36 6	49 2	59 6	49 30	2 37	2 60	1 18	3 18	0 33	2 39	0 90	0 93	1 76	2 66	5 42	4 36	34 91
1894	75 0	78 0	77 0	68 0	56 0	37 0	35 0	28 0	28 0	40 0	54 0	63 0	53 80	2 85	0 37	0 51	4 86	1 28	2 24	1 06	2 24	1 46	2 52	2 75	3 06	25 39
1895	73 0	74 0	76 0	71 0	50 0	39 0	31 0	20 0	19 0	38 0	55 0	64 0	50 08	2 61	5 46	2 28	2 67	0 37	2 58	4 24	1 44	0 19	1 05	3 98	3 05	29 42
1896	72 0	78 0	75 0	62 0	52 0	38 0	36 0	29 0	30 0	36 0	60 0	70 0	53 00	2 18	8 01	3 90	9 44	1 71	1 01	0 81	0 85	1 23	0 88	2 35	4 40	36 77
1897	73 0	78 3					32 0	31 0	39 0	51 0	61 0			5 43	6 75						4 90	0 58	4 16	3 54	1 86	

TABLE VIII. METEOROLOGICAL TABLES—CONTINUED.

1874—OMAHA—1897.

Lat., 41° 0′ N.; Long., 96° 0′ W. Elevation above sea level, 1,113 feet. Observations represent Western Iowa.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1874	73.1	79.6	77.2	61.7	53.6	36.0	18.2	12.2	23.0	33.1	44.7	66.1	49.12	6.93	0.54	2.08	7.18	1.45	1.05	0.54	0.33	0.02	1.49	2.01	1.34	25.75
1875	70.9	74.2	70.0	62.5	47.6	32.6	33.9	10.8	25.7	30.2	44.9	62.9	47.18	10.95	10.01	1.77	2.55	1.16	0.13	1.00	0.26	0.51	1.24	3.06	4.25	39.89
1876	68.2	73.2	74.9	62.2	49.9	33.1	19.0	16.7	30.4	29.2	51.1	63.0	48.51	3.47	7.30	6.37	4.93	0.69	1.17	0.16	0.23	0.40	3.18	2.65	2.07	32.51
1877	69.1	75.6	72.6	66.4	51.2	36.0	28.9	20.2	27.3	33.9	50.1	60.3	50.96	8.39	0.96	3.13	2.05	5.86	1.39	2.14	0.53	0.44	1.26	6.24	8.62	40.92
1878	69.7	79.0	76.8	64.1	52.0	43.8	21.5	28.8	36.7	47.9	54.6	58.1	52.00	8.48	7.66	2.48	3.22	0.55	0.29	0.27	1.23	0.14	3.09	3.97	5.77	37.05
1879	72.7	78.5	75.0	62.5	61.5	40.3	17.3	21.7	28.8	41.0	53.6	60.8	50.96	4.09	3.17	1.51	1.43	3.64	4.25	1.78	0.07	0.93	2.17	1.77	5.53	30.41
1880	73.0	76.7	74.2	62.9	49.2	38.4	18.4	24.5	30.9	35.9	51.2	69.4	50.22	3.14	5.36	7.10	2.91	3.54	1.70	0.28	0.90	0.14	0.50	0.75	3.40	29.52
1881	74.9	78.9	80.4	68.0	54.4	36.9	36.0	11.8	17.0	37.6	44.4	67.8	50.56	5.56	5.89	1.65	8.36	4.84	1.29	1.56	0.61	3.09	0.82	4.23	7.94	45.75
1882	71.0	71.7	73.1	67.5	57.2	39.7	24.6	27.5	36.2	40.2	52.0	58.6	51.11	12.05	6.76	6.95	0.51	5.09	1.42	0.92	0.74	6.60	0.79	5.91	4.91	65.89
1883	69.1	75.7	71.3	0.8	49.4	39.2	28.1	11.9	21.7	34.6	53.6	57.3	47.76	12.70	4.79	3.39	4.53	5.03	0.64	0.73	1.01	1.00	0.32	3.23	11.29	48.83
1884	72.3	74.5	70.8	68.6	57.3	39.3	17.3	17.0	19.4	35.3	47.5	61.6	48.26	6.11	10.35	7.07	4.91	5.81	0.42	0.72	0.78	1.42	4.91	3.88	1.45	47.68
1885	71.2	77.0	69.9	64.5	49.8	39.9	28.6	12.2	16.6	36.1	50.1	59.8	47.47	2.67	9.24	4.99	2.50	3.86	0.74	1.17	0.41	0.47	0.33	0.34	4.43	33.14
1886	70.2	77.9	74.6	65.1	58.3	34.3	17.9	11.9	24.4	31.9	60.9	65.1	48.82	1.50	0.69	4.53	4.45	1.33	1.54	1.46	1.15	0.36	1.31	7.77	4.58	30.67
1887	72.4	76.3	72.0	65.2	50.7	39.6	29.0	11.8	18.2	38.0	54.3	66.1	48.95	4.56	2.02	3.94	2.44	0.72	0.89	1.11	0.49	1.00	0.48	0.88	1.39	19 92
1888	70.0	77.6	70.3	61.3	48.4	36.7	30.4	8.0	25.9	28.8	52.5	55.9	47.15	3.88	2.56	3.44	0.24	1.19	0.12	0.96	0.58	0.74	4.25	2.95	4.36	30.88
1889	68.7	74.8	74.0	63.6	52.2	35.3	29.4	22.8	21.1	40.2	52.4	61.6	50.50	5.44	4.94	2.90	1.74	0.34	0.87	0.58	1.62	0.23	0.59	1.19	2.67	22.87
1890	74.0	78.8	76.5	63.7	52.0	42.0	35.0	18.0	25.0	33.0	55.0	60.0	50.58	5.04	3.74	1.02	2.50	1.89	1.01	0.48	1.44	0.54	1.35	1.55	2.72	22.08
1891	69.0	71.0	72.0	70.0	53.0	34.0	35.0	30.0	29.0	29.0	54.0	58.0	48.16	6.66	3.54	2.02	1.76	5.37	0.37	2.07	2.11	1.02	0.26	6.80	4.34	36.23
1892	71.6	76.0	73.0	69.0	57.0	38.0	22.0	18.0	30.0	34.0	48.0	54.0	49.08	1.51	3.64	2.50	1.63	1.28	0.14	1.59	0.42	0.54	2.74	4.52	5.43	29 44
1893	73.0	77.0	76.0	68.0	55.0	37.0	37.0	16.0	20.0	34.0	48.0	59.0	47.01	7.11	3.03	3.62	1.72	0.12	0.44	1.13	0.28	0.97	1.29	3.12	3.84	26.66
1894	74.0	77.0	75.0	67.0	55.0	37.0	33.0	21.0	22.0	43.0	54.0	65.0	50.22	4.74	0.61	0.36	2.48	2.94	0.11	0.94	0.51	1.30	0.91	2.31	0.61	17 82
1895	70.0	74.0	74.0	71.0	50.0	37.0	29.0	19.0	21.8	37.4	58.0	64.0	50.44	4.31	1.38	7.18	0.90	0.07	1.06	0.16	0.35	0.62	0.99	3.56	1.11	21.69
1896	72.0	74.6	73.9	60.0	51.8	39.8	25.3	27.4	32.6	31.6	56.1	66.9	54.00	1.90	4.53	3.50	3.90	3.72	2.02	0.50	0.33	0.33	1.31	4.78	9.51	35.82
1897	72.0	78.8	.....	.....	.....	.....	.....	.....	30.9	27.2	34.6	50.5	61.8	.....	.....	.....	.....	.....	.....	.....	.....	0.87	0.63	1.47	5.67	2.16	.....
	73.0	74.2												1.43	3.01											

TABLE IX. METEOROLOGICAL TABLES—CONTINUED.

1889—SIOUX CITY—1897.

Elevation above sea level, 537 feet.

YEARS.	COMPARATIVE MEAN TEMPERATURE (DEGREES).													COMPARATIVE PRECIPITATION (INCHES).											
	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Average mean for year.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total for year.
1889	.....	76.1	73.2	61.0	50.4	39.0	35.2	.....	.....	.....	.....	.....	.....	2.61	3.31	1.19	1.71	0.21	1.99	1.14	.....	.....	.....	.....	.....	.....
1890	72.4	76.0	69.1	61.8	50.2	40.4	31.8	14.0	22.9	28.4	50.1	57.8	48.71	7.82	5.77	2.54	0.91	3.04	0.27	2.48	1.66	1.98	2.01	1.22	2.41	33.29
1891	67.8	69.5	70.2	68.1	50.5	33.2	30.0	27.5	25.4	34.7	52.6	59.9	48.25	1.56	2.63	4.14	0.57	1.32	0.16	0.30	0.41	0.97	1.16	1.78	8.56	23.36
1892	69.0	73.0	71.8	66.0	55.4	44.0	25.8	14.7	24.7	31.8	46.5	52.0	48.08	1.68	2.39	5.85	1.11	0.58	0.75	1.87	0.34	0.77	1.43	3.56	3.17	23 45
1893	72.0	75.0	70.0	66.0	51.0	34.0	30.0	13.6	18.2	28.1	44.0	57.0	47.79	2.74	1.81	1.68	0.73	2.58	0.17	1.30	0.60	0.19	0.64	2.79	1.61	17 84
1894	72.0	76.0	75.0	66.0	53.0	34.0	30.0	15.0	19.0	31.0	52.0	62.0	48.08	2.16	2.63	1.54	3.91	0.10	0.00	0.02	0.16	0.33	0.56	3.29	3.15	23.89
1895	68.0	72.0	71.0	68.0	47.0	35.0	26.0	14.0	19.0	34.0	57.0	62.0	47.08	2.94	5.54	0.86	2.09	2.59	2.89	0.25	0.78	0.35	0.50	6.16	6.39	30.77
1896	69.6	73.4	71.8	59.4	47.2	32.4	30.0	22.9	28.4	27.3	52.4	64.4	47.20	2.13	2.26	.....	.....	.....	.....	.....	1.41	0.43	1.74	4.05	1.24	.....
1897	68.0	74.2	.....	.....	.....	.....	.....	14.3	21.7	28.8	47.6	59.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE X. METEOROLOGICAL TABLES—CONTINUED.

1874—COMPARATIVE TEMPERATURE AND PRECIPITATION—1896.

	AVERAGE MEAN TEMPERATURE (DEGREES).						TOTAL PRECIPITATION (INCHES).					
Y'RS.	Davenport.	Des Moines.	Dubuque.	Keokuk.	Omaha.	Sioux City.	Davenport.	Des Moines.	Dubuque.	Keokuk.	Omaha.	Sioux City.	Cedar Rapids.
1874.	49	....	49	51	49	....	36.79	.....	36.12	34.77	25 75	.....	.....
1875.	44	....	44	48	47	....	37.90	.....	35.12	48.10	19.89	.....	.....
1876.	49	....	47	59	48	....	46.89	.....	50 28	31.71	32 51	.....	.....
1877.	50	....	50	52	50	....	35 09	.....	38 07	49.19	40 92	.....	.....
1878.	53	....	50	55	52	....	31 12	.....	38 26	31.78	37 05	.....	.....
1879.	50	51	48	52	50	.....	53.80	52.60	52.51	52.51	30.41	.....	.....
1880.	51	51	49	54	50	.....	42.74	37.23	31 54	34.84	29 52	.....	.....
1881.	50	49	48	51	50	.....	37 68	55 91	42.40	42 40	45 75	.....	.....
1882.	51	52	40	52	51	.....	38 50	48.67	41.13	41.53	45.59	.....	.....
1883.	48	46	45	49	47	.....	35 33	41.79	39.65	38.65	48 83	.....	.....
1884	48	46	46	50	48	.....	38.11	34 28	31.58	31.98	47.68	.....	.....
1885..	45	46	46	48	47	.....	34 38	28.02	34 41	34 11	33 14	.....	42 28
AVERAGE BY MONTHS FOR 24 YEARS.							AVERAGE BY MONTHS FOR 24 YEARS.						
Jan.	18	18	17	21	19	17	19	1.32	0.97	1.56	1.56	0.78	0.70	0.16
Feb.	25	23	22	28	25	20	22	1.38	0.91	1.37	1.74	0 98	0.60	1.67
Mar.	35	35	31	38	35	31	32	2.25	1.63	2.11	1 96	1.02	1.20	2 44
Apr.	50	51	48	52	51	51	51	2 72	2 28	2.83	3.87	3.04	3.01	2.98
May.	61	61	60	62	62	59	60	4 07	3.35	3 90	4 13	4.37	3 83	4.31
June	71	71	68	71	72	70	73	3 60	4.22	4 92	4.30	5.87	3 29	3.79

	AVERAGE MEAN TEMPERATURE (DEGREES).						TOTAL PRECIPITATION (INCHES).					
YR'S.	Davenport.	Des Moines.	Dubuque.	Keokuk.	Omaha.	Sioux City.	Cedar Rapids.	Davenport.	Des Moines.	Dubuque.	Keokuk.	Omaha.	Sioux City.	Cedar Rapids.
1886..	47	49	48	49	48	....	47	22.62	29.17	29.66	29 66	24.67	.....	26.39
1887..	48	48	49	51	48	.....	45	32 78	24 63	32 50	26 92	19.92	.....	31.41
1888..	46	45	44	48	47	....	45	40 46	31.15	32.91	34.80	20 88	.....	36.56
1889..	48	49	49	54	50	....	48	37.61	24.13	24.18	34 75	22 57	.....	31.18
1890..	49	49	48	52	50	48	48	24 50	25 12	40.28	28 97	23 08	23.75	35.92
1891..	49	48	48	51	48	46	48	30 05	30.14	28.55	33.15	29 92	33.39	33.25
1892..	48	47	46	50	49	46	48	44.15	39.24	40 60	37.45	29.44	26.38	42.63
1893..	47	47	45	49	47	47	45	27.33	25.36	32.77	24 94	28.66	23 45	30.67
1894..	41	51	50	53	50	48	50	18 54	20.56	19 28	28.39	17.82	17 84	23.69
1895..	48	48	48	50	50	47	48	27.14	26 80	19 74	26.42	21.89	20 29	23 39
1896..	50	50	49	53	54	41	41	28.48	30.90	42.28	30.77	25.82	30.77	29.77
AVERAGE BY MONTHS FOR 24 YEARS.								AVERAGE BY MONTHS FOR 24 YEARS.						
July.	75	72	74	77	76	74	73	3.80	2.54	4.43	3.57	4.27	3.79	3.74
Aug.	73	72	71	73	74	72	71	3 27	2 66	2 86	4.12	3 55	3 27	2.85
Sept.	65	64	62	65	65	64	63	3.27	2 45	4.41	3 61	2.50	1 09	1.79
Oct..	52	54	50	54	53	50	49	3.05	2 39	2.56	2 66	2.71	1.85	2.41
Nov..	37	37	35	41	37	32	31	2.68	1.84	2.01	2.03	0.91	1.13	1.73
Dec..	23	27	25	31	27	28	27	1.40	1.13	1.59	1.71	0.91	0.72	1.75

TABLE XI. METEOROLOGICAL TABLES—CONTINUED.

1880—DES MOINES—1897.

Maximum and Minimum Temperature for the Years Named.*

YEARS.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.		ANNUAL.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1880	63	10	68	1	80	- 2	84	26	93	44	93	48	94	53	96	51	87	41	77	26	62	0	49	17	96	- 2
1881	42	-19	45	- 8	52	6	81	11	88	40	96	54	98	56	103	57	93	49	80	32	60	8	56	10	103	-19
1882	51	- 1	65	1	74	10	83	31	82	33	92	44	92	52	91	51	93	37	80	32	71	15	50	17	92	- 1
1883	39	-28	50	-23	67	3	82	29	83	35	93	50	97	54	91	48	90	37	80	28	67	6	57	10	97	-28
1884	49	-20	50	- 5	70	- 6	74	26	80	35	95	47	95	55	91	49	92	43	86	28	64	2	50	18	95	-20
1885	47	-20	50	-23	63	7	76	26	92	28	93	44	100	54	90	16	87	45	77	29	66	21	53	- 5	100	-30
1886	36	-24	51	-20	69	8	83	20	93	37	101	44	104	58	101	46	93	38	84	27	68	9	54	-19	104	-24
1887	41	-24	53	-15	74	9	86	18	93	36	93	45	101	52	100	45	92	40	82	13	73	- 9	50	-12	101	-24
1888	43	-27	57	-20	72	- 4	79	21	81	34	88	43	99	56	96	46	90	32	79	27	75	19	60	11	99	-27
1889	50	- 1	52	-13	69	16	82	34	85	34	88	37	90	51	93	47	88	31	85	26	63	4	60	8	93	-13
1890	50	-18	59	- 5	66	- 8	83	25	89	32	96	49	101	55	97	48	89	33	79	22	67	-10	60	0	93	-10
1891	47	6	55	-10	60	- 5	81	29	83	34	90	47	88	49	93	46	90	39	81	28	67	12	54	-16	95	-26
1892	50	-20	53	- 1	73	6	72	25	75	35	93	48	93	50	95	47	92	36	87	25	64	2	50	-10	95	-16
1893	42	-14	45	-15	74	1	80	23	83	33	90	47	95	56	94	42	98	30	83	19	65	- 8	56	- 5	104	- 8
1894	55	-27	54	- 8	74	4	87	28	90	36	99	43	104	53	100	47	93	37	82	30	66	4	63	0	98	-18
1895	64	-14	64	-18	88	3	88	26	94	35	89	50	98	60	95	53	94	33	75	15	74	- 1	57	13	99	- 2
1896	49	- 8	59	- 2	71	2	88	30	87	46	91	49	95	54	94	47	83	32	75	26	74	- 1	59			
1897	61	-17	48	-14	60	- 2	79	29	83	39																

* Figures preceded by a dash (-) indicates below zero.

TABLE XII.

METEOROLOGICAL TABLES—CONTINUED.

1839—MUSCATINE AND IOWA CITY—1870.

Maximum and Minimum Temperature for the Years Named.*

Years.	Jan. Max.	Jan. Min.	Feb. Max.	Feb. Min.	March Max.	March Min.	April Max.	April Min.	May Max.	May Min.	June Max.	June Min.	July Max.	July Min.	Aug. Max.	Aug. Min.	Sept. Max.	Sept. Min.	Oct. Max.	Oct. Min.	Nov. Max.	Nov. Min.	Dec. Max.	Dec. Min.	Annual Max.	Annual Min.
1839	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1840	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1841	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1842	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1843	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1844	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1845	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1846	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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1848	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1849	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1850	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1851	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1852	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1853	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1854	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1855	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1856	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1857	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1858	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1859	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1860	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1861	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1862	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1863	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1864	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1865	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1866	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1867	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1868	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1869	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1870	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

*Observations made by T. S. Parvin, at Muscatine, 1839 to 1860, and at Iowa City, 1860 to 1870.

NORMALS OF TEMPERATURE FOR TWENTY YEARS.

The following table is compiled from observations of Prof. T. S. Parvin, from 1861 to 1871, and from those of Prof. G. Hinrichs, of the Iowa Weather Service, from 1871 to 1880, and are the result of nearly thirty thousand observations, which were made at Iowa City. The values given are for each decade of each month:

MONTHS.	MEAN TEMPERATURE, DEGREES F.				RAINFALL IN INCHES.			
	I.	II.	III.	Month.	I.	II.	III.	Month.
January	.52	.60	.60	1.72	18.7	19.1	20.3	19.4
February	.55	.55	.70	1.80	22.0	24.4	27.1	24.4
March	.80	.95	1.10	2.85	29.6	32.3	37.3	33.1
April	1.20	1.20	1.10	3.50	43.3	47.9	51.6	47.6
May	1.20	1.20	1.35	3.75	55.5	60.0	63.6	59.9
June	1.65	1.65	1.55	4.85	66.3	68.8	71.8	69.0
July	1.65	1.27	1.20	4.12	73.7	74.1	73.8	73.9
August	1.42	1.65	1.85	4.92	73.1	71.8	69.6	71.3
September	1.80	1.55	1.25	4.60	66.4	62.9	59.4	62.9
October	1.10	.95	.90	2.95	55.0	50.3	45.1	49.9
November	.95	.82	.70	2.47	40.7	35.8	29.2	35.2
December	.60	.50	.50	1.60	26.3	23.2	20.2	23.1
Total for the year (mean)				39.14				47.47

RAINFALL FOR FORTY-FIVE YEARS.

The following is a record of the rainfall in Iowa for a period of forty-five years as observed at Muscatine, Iowa, by J. P. Walton, Rev. J. Ufford, S. Foster and Prof. T. S. Parvin, voluntary and Smithsonian observers:

Year.	Inches.	Year.	Inches.	Year.	Inches.	Year.	Inches.	Year.	Inches.	Year.	Inches.	Year.	Inches.	Year.	Inches.	Year.	Inches.
1846	34.55	1851	74.50	1856	41.94	1861	44.25	1866	32.86	1871	36.11	1876	53.57	1881	45.66	1886	31.32
1847	28.50	1852	59.38	1857	34.85	1862	55.16	1867	32.24	1872	35.44	1877	41.78	1882	46.67	1887	28.30
1848	39.62	1853	44.92	1858	59.45	1863	29.83	1868	40.91	1873	28.42	1878	39.30	1883	41.12	1888	38.69
1849	59.16	1854	23.66	1859	35.96	1864	33.77	1869	43.36	1874	34.78	1879	33.83	1884	45.49	1889	33.47
1850	49.08	1855	1.13	1860	25.10	1865	34.21	1870	24.61	1875	37.59	1880	35.78	1885	39.14	1890	31.87

MEAN FOR EACH MONTH DURING THE FORTY-FIVE YEARS.

January.. 1.96	March.... 2.71	May...... 4.40	July...... 3.95	Sept...... 3.80	Nov...... 2.54
February 2.08	April 3.37	June...... 4.78	August... 4.49	October.. 3.01	Dec...... 2.35

FINANCIAL STATEMENT.

FOR THE BIENNIAL PERIOD ENDING JUNE 30, 1897.

RECEIPTS.

Warrants on State Treasurer June 30, 1895, to June 30, 1896	$ 4,995.73	
Warrants on State Treasurer June 30, 1896, to June 30, 1897	4,494.47	
		$ 9,490.20

EXPENDITURES.

June 30, 1895, to June 30, 1896—			
Secretary's salary	$ 1,200 00		
Expenses of board meetings	630.75		
Contingent expenses	3,164.98		
		$ 4,995.73	
June 30, 1896, to June 30, 1897—			
Secretary's salary	$ 1,200 00		
Expenses of board meetings	739.10		
Contingent expenses	2,555.37		
		$ 4,494.47	
			$ 9,490.20

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