SEVENTEENTH BIENNIAL REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF IOWA

FOR THE

Fiscal Year Ending June 30, 1914

PRINTED BY ORDER OF THE GENERAL ASSEMBLY

DES MOINES
ROBERT HENDERSON, STATE PRINTER
1914

LETTER OF TRANSMITTAL.

STATE OF IOWA,

OFFICE OF SECRETARY STATE BOARD OF HEALTH

Des Moines, Iowa, October 31, 1914.

To His Excellency, G. W. Clarke, Governor of Iowa:

SIR—In accordance with the provisions of Section 2565 of the Code, I have the honor to present the Seventeenth Biennial Report of the State Board of Health for the period commencing July 1, 1912, and ending June 30, 1914.

Very respectfully yours,

GUILFORD H. SUMNER, M. D., *Secretary.*

MEMBERS OF THE STATE BOARD OF HEALTH, JUNE 30, 1914.

Hon. G. W. Clarke, Governor, Ex Officio, Des Moines.

Hon. W. S. Allen, Secretary of State, Ex Officio, Des Moines.

Hon. J. L. Bleakly, Auditor of State, Ex Officio, Des Moines.

Hon. W. C. Brown, Treasurer of State, Ex Officio, Des Moines.

PHYSICIANS.

Dr. G. F. Severs, (E) Centerville; term expires June 30, 1915.

Dr. J. L. Tamisiea, (R) Missouri Valley; term expires June 30, 1916.

Dr. H. A. Dittmer, (H) Manchester; term expires June 30, 1917.

Dr. W. L. Bierring, (R) Des Moines; term expires June 30, 1919.

CIVIL AND SANITARY ENGINEER.

Prof. Lafayette Higgins, Des Moines; term expires June 30, 1918.

OFFICERS OF THE BOARD.

Dr. W. L. Bierring, President, Des Moines.

Dr. G. F. Severs, Vice President, Centerville.

Dr. G. H. Sumner, Secretary, Des Moines.

Dr. Henry Albert, State Bacteriologist, Iowa City.

Prof. C. N. Kinney, State Chemist, Des Moines.

GENERAL CLASSIFICATION OF BOARDS AND OFFICIAL DEPARTMENTS LOCATED IN STATE BOARD OF HEALTH OFFICE.

MEMBERS OF THE BOARD

EX OFFICIO MEMBERS

Hon. G. W. Clarke, Governor.....Des Moines
Hon. W. S. Allen, Secretary of State.....Des Moines
Hon. J. L. Bleakly, Auditor of State.....Des Moines
Hon. W. C. Brown, Treasurer of State.....Des Moines
Dr. Guilford H. Sumner, Secretary-Executive Officer.....Des Moines

BOARD MEMBERS

Dr. Walter L. Bierring, President.....Des Moines
Dr. Geo. F. Severs, Vice-President.....Centerville
Dr. John L. Tamisiea, Member.....Missouri Valley
Dr. Henry A. Dittmer, Member.....Manchester
Lafayette Higgins, C. E., Sanitary Engineer.....Des Moines

STATE EXAMINATION OF PHYSICIANS

Dr. Walter L. Bierring, President.....Des Moines
Dr. Guilford H. Sumner, Secretary and Treasurer.....Des Moines

MEMBERS—The Physicians of the State Board of Health

STATE EXAMINATION OF NURSES

Dr. Walter L. Bierring....Des Moines Catherine Earhart, R. N...Des Moines
Dr. Henry A. Dittmer.....Manchester Jennie Johnson, R. N.....Sioux City

STATE EXAMINATION OF EMBALMERS

Dr. George F. Severs.....Centerville Charles Emerson, L. E.....Creston
Dr. John L. Tamisiea.....Mo. Valley C. S. Hopkins, L. E.....Lake City

STATE EXAMINATION OF OPTOMETRISTS

Howard M. Boughton, Pres. Eagle Grove George J. Feige.....Des Moines
Thomas M. Buchanan.....Waterloo Dr. George F. Severs.....Centerville

LABORATORY, STATE BACTERIOLOGIST

Dr. Henry Albert, Bacteriologist.....Iowa City
Dr. Harve E. Harlow, Ass't Bacteriologist.....Iowa City

LABORATORY, STATE CHEMIST

C. N. Kinney, A. C., M. S., State Chemist.....Des Moines
Gharrett Jordan, B. S., Ass't State Chemist.....Des Moines
Miss Frances David, Ass't State Chemist and Clerk.....Des Moines

STATE REGISTRATION OF VITAL STATISTICS

Dr. Guilford H. Sumner.....State Registrar and Superintendent

LEGAL DEPARTMENT

George Cosson, Attorney-General.....Des Moines

Assistants to Attorney General.

John Fletcher.....Des Moines
C. A. Robbins.....Des Moines

Special Counsel:

Wiley S. Rankin.....Des Moines
Henry E. Sampson.....Des Moines

INSPECTION OF LODGING HOUSES AND HOTELS

Lafayette Higgins, C. E., Hotel Inspector.....Des Moines
Deputy Hotel Inspectors:
Jacob B. Heefner, Chief Deputy.....Des Moines
L. C. Clifford.....Des Moines
W. A. Roe.....Des Moines

Bacteriological Examinations, Dr. Henry Albert.....Iowa City
Chemical Examinations, Prof. C. N. Kinney.....Des Moines

N. B.—Correspondence relating to examinations for Physicians, Osteopaths, Nurses, Embalmers and Optometrists should in all cases be addressed to Dr. Guilford H. Sumner, Secretary, Capitol Building, Des Moines, Iowa. The regular meetings of the State Board of Health and State Board of Medical Examiners are held semi-annually, in July and January of each year, and at such other times as it may be deemed necessary by the Secretary, or on the written request of two or more members of the Board of Health, such meeting to be held at the seat of government, in the Capitol Building, in the city of Des Moines.

Vacancies. When vacancies occur in the State Board of Health it shall be the duty of the Governor, Secretary of State, and Auditor of State, by and under the authority vested in them, by Chapter 207, Acts of the Thirty-fifth General Assembly, to appoint to membership on the Board all the officers mentioned in said Chapter. The Governor, Secretary of State, and Auditor of State constitute a Board of Appointment, and the Secretary of the Executive Council is the Secretary thereof. Two members of the Board of Appointment constitute a quorum for the purpose of making appointments. The terms of all officers appointed by said Board of Appointment are for five years, except the first appointments which, for the members, shall be for one, two, three, four and five years, respectively, their terms to be designated by the Board of Appointment, and to be so arranged that the term of one such member shall expire on the thirtieth day of June of each year. At the expiration of the term of each member, his successor shall be appointed for a full term of five years. [*Chap. 207, Acts of the 35th G. A.*]

New Board. At the beginning of the new biennial period when the new Board was inducted into office, Dr. Walter L. Bierring was unanimously elected the first president of the two Boards, the State Board of Health and the State Board of Medical Examiners. Dr. Bierring's term expired on June 30, 1914, and he was re-appointed to succeed himself, having served but one year. His new term will expire June 30, 1919. When the Board met at its annual meeting in July, Dr. G. F. Severs of Centerville was placed in nomination for the presidency of both Boards, but he declined and asked that Dr. Bierring be re-elected as Dr. Bierring lived in Des Moines, and could be more easily reached on that account. Dr. Bierring was then unanimously re-elected as the president of both Boards to succeed himself for the ensuing year, and Dr. Severs was unanimously elected vice president. The new law is working smoothly and nicely, and in just such a manner as the Thirty-fifth General Assembly intended. The last legislature is to be congratulated upon the enactment of this law.

GENERAL INFORMATION FOR PEOPLE OF IOWA.

By Dr. Guilford H. Sumner, Secretary.

Section 2565 of the Code of Iowa, 1897, relates to the *powers, regulations* and *reports* of the Iowa State Board of Health.

"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." [22 G. A., ch. 82, § 37; 18 G. A., ch. 151, § § 2, 4, 11.]

Because of the above section, the Secretary will endeaver to perform the duty placed upon him:

"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."

Vital Statistics. Again we call attention, in this our Seventeenth Biennial Report, that our State has not made any material progress in improving our law relating to Vital Statistics. Births and deaths are not properly reported by the assessors, and undertakers, as the law provides. Assessors over the State are not proficient in obtaining birth records, though county auditors and county clerks have been repeatedly notified and instructed regarding the law, and have been provided with the necessary blank forms which correspond to those furnished by the United States Census Bureau, at Washington, D. C. The reason for this is not known by the State Board of Health. The undertakers are in many instances very derelict in sending in the death certificates which come into their hands, though they have been repeatedly notified that all death certificates should be sent to the

State Board of Health office, on or before the fifth day of each month, for all deaths which have occurred in the preceding month. There should be some method whereby proper records of births and deaths can be procured and kept by our State. It is certainly necessary that there should be some legislation in order to bring about an improvement in Vital Statistics work in our State. We hope for this improvement to be forthcoming in the near future, by action of the on-coming legislature.

In this connection it may well be noted that the basis of all scientific hygienic work is Vital Statistics. This is the bookkeeping of humanity. It gives us the only means of knowing the whereabouts of disease and the extent of the losses caused by it. How necessary it is for every commander of a vessel to know the latitude and longitude of his position when upon the sea! Vital Statistics tell us of our social latitude and longitude on the sea of time; real things a nation must know, if the rocks and reefs of disease are to be avoided and the nation is to endure. It has been demonstrated that the great enemy of mankind is disease, and if we can possibly know the strength of our destroyer, then we may hope to eliminate this monster by combating it with the proper weapons of defense. With this knowledge before us, the first thing to be done to bring about better conditions in Iowa is for the legislature to prepare and pass a better Vital Statistics law. This will be the first step for the successful conduct of a movement for the betterment of the public health, hence every person should do his part and see to it that the births, deaths and contagious diseases which occur in his family are properly reported.

The importance of recording births properly may be well illustrated by relating the following instances: A young man and wife came from Switzerland and settled in a nearby state. They were hardy, honest and industrious. They settled in a county by the name of Switzerland, doubtless being attracted by the name of their home-land. In the course of time a baby girl came to brighten their home. The father being thrifty and intelligent, was soon made a foreman in a saw-mill. When his child was about two years old, the father was accidentally killed by a log rolling over him. Time had not been sufficient for him to accumulate property, hence the wife struggled with wash-tub and needle to earn a living for herself and child.

One day the news came that a brother of the father, the child's uncle in Switzerland, had died leaving $12,000 to the issue of his brother. Great was the rejoicing which, on account of the neglect of the physician to record the birth, was to become bitter sorrow. Before the Swiss Government would turn over the property, it must have proof that the little child was the issue of the dead man. Neighbors knew of the birth of the child, but could not testify except as to their belief of the fatherhood. The testimony of the mother was not admissible in her own country for she could lead any child into court and declare any man to be the father. It was the physician's birth certificate, made at the time of birth and presumably in the presence and by the authority of the father, that the law demanded. It could not be produced, and the helpless infant that the *physician should have been eager to protect and serve*, lost its inheritance. What a cruel and unnecessary blow was this from the hand of a practitioner of the learned and benevolent science of medicine! Surely a physician's duty to the families he serves and to the helpless infants are not fully performed until he has made out a certificate of birth and taken reasonable care that it is made of due legal record. Another incident is related of a farmer who left his valuable estate in trust, to his unthrifty son, to go to his granddaughter on her twenty-first birthday. The girl had been told that the date of her birth was on a certain day of the month and year; and always celebrated the day as her birthday. The time came when she believed she was twenty-one, and therefore claimed her inheritance. Her father denied her age, saying she was only nineteen. The family Bible was appealed to, but the leaf containing the family record was gone. No birth record had been rendered and the attending physician was dead. The court was in a quandary. A Solomon was needed for judgment. At last a neighbor remembered that a valuable cow belonging to the grandfather had given birth to a calf on the day the girl was born, and he could swear to it. Perhaps the grandfather had recorded the date of the birth of the calf. His farm books showed this to be the case. The date of the birth of the human being was established.

What has been related regarding births is essentially true of the other departments of Vital Statistics. It is as necessary that all stillbirths and deaths be reported in order that the proper tables of mortality may be made. These tables are essentially use-

ful in studying all public health measures; and without them, we are like one traveling on a road with no guide-posts.

Marriages and divorces should also be properly recorded, for, in many instances a lack of proper records leads to serious complications as in cases of improper records of births.

Another important department of Vital Statistics is the proper recording of prevailing contagious and infectious diseases, for with such information at hand, Boards of Health are enabled to take active measures to prevent the spread of such diseases. It should be stated in this connection that the number of communicable diseases to be reported to the State Department of Health should be amplified and made to include the following: *anterior poliomyelitis, anthrax, bubonic plague, cancer, cerebrospinal meningitis, chickenpox, cholera, diphtheria, hydrophobia, leprosy, measles, ophthalmia neonatorum, pellagra, pneumonia, scarlet fever, smallpox, tetanus, pulmonary or laryngeal tuberculosis, typhoid fever, typhus fever, whooping cough and yellow fever.*

Referring again to births: If society is to continue, it must be recruited by births. While our population is increasing by immigration, if we are to have a healthy growth, the number of births must exceed that of deaths, hence the early notification of births is essential for the prevention of disease, and the total number of births in a state or a city is the basis of that important ratio known as Infant Mortality. The full measure of protection to infant life can not be given unless all births are promptly reported.

If we are to obtain accurate statistics of births, it is necessary that every birth should be properly reported for record. Upon a proper record of Vital Statistics therefore depends the prosperity and health of all states and nations. It is the most important of all departments of public health boards and should be the most liberally provided with funds for the carrying on of the work of proper registration and reports. Vital Statistics is the complete registration and tabulation of the population, marriages, births, diseases, deaths and divorces. Coupled with this, the full analyses of all the resulting illustrations with the purpose in view to examine thoroughly the path of sanitary progress should be the ultimate object.

Because of the importance to the people of Iowa the legislature

should, before adjournment, make ample provision for a Vital Statistics department, and formulate a law whereby proper records may be kept and full reports secured, thereby admitting Iowa into the registration area of the United States Census Bureau of Vital Statistics.

It was that genuine philosopher and statesman, Benjamin Franklin who said, "Public Health is Public Wealth." The truth of this statement can not be disputed and it is to be hoped that our present statesmen will become enthused with these true economics to the extent that needed legislation will be enacted for improving the present public health measures.

Disraeli said, "The care of the public health is the first duty of statesmen." Gladstone said, "In the health of the people lies the strength of the Nation," and on public health matters, the New York City Board of Trade passed unanimously, a resolution which reads as follows:

"Resolved, That the health and protection of life are more precious to the people and more necessary to their happiness than even the extension of our commerce, the fostering of our agricultural interests, the solving of our financial problems, the cheapness or efficiency of our postal service, the importance of improving our rivers and harbors or the enlargement of our navy." In connection with this most excellent resolution, let it be remembered that our own GOVERNOR CLARKE of our own state of Iowa said in the July session of the Iowa State Board of Health, 1914, the following which covers in a single sentence all that is said in the above resolution: "THE HEALTH AND HAPPINESS OF THE PEOPLE ARE PARAMOUNT TO EVERY OTHER ISSUE." What more can be embodied in a proposition which shall relate to the general welfare of humanity?

The men who gave utterance to the statements related above are not to be considered as physicians or sanitarians, but as practical, successful business men who have accomplished much, both in public and private life. It should be observed, however, that the teachings of the medical profession have always been in accord with the resolutions now so generally adopted.

The conclusion is, therefore, that the importance of Vital Statistics to the individual, the family and the State, can hardly be over-estimated. The physician is, except in rare instances, the

only member of society who can supply information in regard to the causes of death and the presence of contagious and infectious diseases; and a physician should remember when reporting Vital Statistics that he is giving obedience to the statutes of Iowa, on which he depends for protection; and that he is protecting the innocent and helpless, thus doing a general good and serving the profession to which he belongs and which he should delight to honor.

Knowledge Respecting Diseases. The purposes of all health boards are that all transmissible diseases may be prevented, and this is brought about by a study of the principles of *hygiene,* which is the science that deals with the laws of health, in its broadest sense.

Practical hygiene, or sanitary science, is the *art* of preventing diseases (or preserving health), and includes a consideration of the methods that are employed in investigating the manifold phases of the subject.

It must be noted that the fundamental points to be considered in the study of hygiene are those bearing upon the conditions under which we live. *Hygiene* is not so much a study of man as it is a study of man's surroundings, with the view of determining in how far these conditions are conducive or detrimental to his health and happiness.

We find in the earliest medical and ecclesiastical writings sanitary laws for the guidance of man. Present day *hygienists* believe that it is due largely to the inculcation of these precepts, handed down from generation to generation, that we follow particular modes of living and still instinctively avoid certain conditions which were formerly thought to be harmful. Probably the most familiar of the early writings on the subject are the laws of Moses for the guidance of his people. Since practically nothing was then known as to the direct causation of disease, these laws were of necessity empirical, though the measures recommended for preventing the spread of contagion, for cleanliness, for killing of animals for food, for isolation of contagious and infectious diseases, and for the renovation of dwellings inhabited by transmissible diseases are alone sufficient to warrant the belief that they were made from a close observation and a trustworthy experience.

We should note in passing that the older writings on the subject of *hygiene,* and in fact many of those of comparatively modern

date, were in the main speculative, representing the dictates of instinct and intuition. These writings were, nevertheless, of undoubted benefit to those who heeded them and, in so far at least as the Jews are concerned, were unquestionably very beneficial in repeatedly shielding them from the ravages of diseases which were transmissible from person to person.

Abundant evidence has been handed down to us from time to time to convince us in these days of modern times that the importance of personal and municipal *hygiene* was fully appreciated by the earlier civilizations generally. The question of *public health* was one of vital importance in early days, and the people's desire and ability to carry their health precepts into practice have been abundantly discovered through the studying of the customs of ancient peoples. In many instances archeologists in their researches found that ancient peoples' devices for baths, water supplies, disposal of sewage, and for light and air left little to be desired.

Iowa is in the midst of a progressive age—we are progressing wonderfully fast along all lines of education in merchandising, farming, mechanics and the arts and sciences; and with our progress, the growth of communities, and the demands of modern life, it has become evident that the earlier sanitary codes must be recast—made new—to meet the requirements of present and newer conditions. The older regulations were based, as has been related, in many important particulars, upon speculation and erroneous conceptions; though it must be admitted that errors were made more frequently on the right than on the wrong.

As these questions have been studied in the past and progress made, it was realized by the students of *hygiene* and by those who have done most to place it on a sound basis that, through the application of methods of precision to the study of man and his surroundings, much light could be thrown on many phases of the problems that had hitherto been but imperfectly understood. Because of this, through the utilization of chemical, physical, histological, statistical, and bacteriological methods, the empirical *hygiene* of the past has in part given place to the more exact *hygiene* of the present time. With this light shed upon us by such trustworthy methods of analysis, we are in a favorable position to interpret and appreciate the meaning, the value, and the wisdom

of many of the laws and customs that were in vogue in earlier times for the regulation of health and disease.

When we look around that we may form a basis for our conceptions, then we must say that the foundation of modern *hygiene* was laid in the scientific investigations of von Pettenkofer on ventilation and heating, on the relation of soil-moisture to health, on the physial properties of clothing; and those of himself, associated with Voit, on chemistry of respiration and general nutrition, and the chemico-physiological values of food-stuffs in the process of alimentation; and in the brilliant, epoch-making researches of Koch upon the etiological relation of micro-organisms to disease. As we come in contact with these impulses given to the work of *hygiene* by all of the intelligent deductions of these pioneers in modern *hygiene,* we discover that there has been a development in our knowledge along all the many ramifications of the subject, and now the field of *public health* has assumed such vast proportions that only a rare intellect can master in detail its numerous phases and divisions. It is to be noted that already the subject of *hygiene* or *public health* has been divided into its specialities, and complete works on the subject are no longer attempted by single individuals, but are rather edited as systems of monographs, each written by individuals who devote their time exclusively to the study of this or that particular branch of the subject, and who, therefore, have the special knowledge necessary to fully and clearly explain their separate departments. Not only has the development of knowledge upon *public health* alone been very conspicuous but, through special investigations of *public health* significance, its influence has been widespread, and much light has been thrown upon topics of general medical interest.

It must be admitted that it is manifestly inadmissible to connect the teaching of *hygiene* with that of any other branch of medicine. It has become a science of itself, and as such should be in the hands of those who have undergone special discipline necessary to appreciate fully the nature and importance of the problems involved. We have passed the time when the student can receive adequate instruction in this work from the "Professor of Obstetrics and Hygiene," of "Dermatology and Hygiene," of "Materia Medica and Hygiene," as has been the case for so

long a time in many institutions of learning. The times demand that the teacher of this department of *public health* work must be one who has been systematically trained in its various departments, not of necessity to the extent of being master of each branch, but certainly as master of some, and in general to a degree that will enable him to comprehend and explain fully the demands that are presented and which require action to prevent epidemics of disease.

We propound in this connection a few questions which are of vast importance to the physician and to the people who employ him. Why should a physician trained to cure the sick equip himself with a knowledge that he is to employ in preventing sickness? Why should a physician practice preventive medicine and follow the precepts of hygienic teaching? are questions that are occasionally asked. One might easily ask, why does one experience the impulse to rescue from danger a stranger, in whom he has no direct interest? Laying aside the question concerning his functions as a physician, there is every moral reason why he as a man should use his best endeavors to lessen suffering and save life, in so far as it lies in his power to do so, and this too regardless of whether it is to be direct profit to him or not.

Again there are important and material reasons why a physician should be well informed, and have an accurate knowledge of the advances in prevention of diseases, or preventive medicine. *Patients and the public demand it, and in every instance a health officer should be a well informed, practical physician. A mere laboratory man is not sufficient. The health officer must be a skilled diagnostician first of all, capable of detecting transmissible diseases, and in addition to this he should have a complete knowledge of prevention methods.* With the universal progress in general education, the public is no longer satisfied that a physician enter the house, prescribe his medicines, and depart; they desire more: they wish to know the nature, the origin, and the cause of the sickness, the most likely channel or channels through which the disease was contracted, and the most reliable means of preventing its recurrence or spread. If the attending physician or the practitioner cannot promptly supply reasonable answers to these questions, he need not be surprised if his services are

dispensed with, and some other physician employed who can render or give the desired information.

Again for his own enlightenment and personal welfare, the physician should be familiar with sanitary laws, especially those concerning the causation and spread of diseases and the means of preventing them. He should be familiar with the modes of infection, the methods of disinfection, the means for the isolation of the sick, and the general rules of prophylaxis in the management of all transmissible diseases. He should be familiar with the channels through which he himself may become infected or the means by which he may serve as a carrier of infection and the proper precautions for preventing such accidents. As an educated physician he should know, and as a conscientious physician he should practice these precepts for the good, not only of his own patients, but of the community of which he forms a component part. The medicine of the period tends more and more in the direction of prevention rather than cure, and if the physician proposes to keep himself abreast of the times it behooves him to be in touch with the advances along these lines. While ignoring the subject of prevention, a new medicine grows up about him, and he is suddenly aware of his presence in an atmosphere unfamiliar and wholly uncongenial—an atmosphere that he does not appreciate, and with which he experiences no intelligent sympathy or interest, and he becomes a non-progressive, a back number, so to speak.

Boards of Health and the teachings of *hygiene,* or the methods used in disease prevention, have been and are assailed by hostile attacks from those who are either misguided or are behind some mercenary motive, and proof has been demanded by these accusers to show that the practice of sanitary precepts has resulted in the betterment of conditions under which mankind lives, in the prevention of diseases, or in the saving of life. We answer that, while it cannot truthfully be said that every so-called sanitary precaution has been or is beneficial or necessary, or that every article in any sanitary code has been or is based on what has been or is proved to be sound, we can nevertheless combat adverse criticism with an array of evidence that should convince the most skeptical as to the importance, yea, the profound necessity, of an intelligent sanitary control of the conditions under which

we are now living, for there is necessity for this because of the large increase of our number of inhabitants and the introduction into our country of a large citizenship, bringing perhaps transmissible diseases, that is wholly unfamiliar with modern methods of disease prevention. Let us introduce a few examples for illustration to show what sanitary measures have brought about. For instance, to cite a few of the triumphs of *hygiene*: Until the beginning of the present century the average mortality from smallpox in Prussia was 3 per 1,000 of population. In times of epidemics this ratio was commonly very much increased. Since the introduction of compulsory vaccination the mortality from this disease has fallen to its present figure of practically no mortality at all, and, as Flugge states, cases of smallpox are now looked upon in many provinces of Prussia as medical curiosities; and our success in this country lies in our taking the sanitary precaution of being vaccinated in order to eliminate smallpox from our midst entirely.

Characteristically speaking any statement must be considered as an axiomatic, or self-evident truth when no proof is necessary, therefore we will not consider this as a self-evident truth, but will try to be correct in our statements and proof, and will leave our readers to draw their own conclusions. In further speaking of the dreaded smallpox we will say that during the seventeenth and eighteenth centuries the annual death rate from this disease in London ranged from 2 to 4 per 1,000 of population; with the introduction of general vaccination it had fallen for the interval between 1883 and 1892 to 0.073 per 1,000 of population. Schulz states that by the calculation of the Imperial Health Bureau at Berlin, based upon the statistics of mortality for smallpox for the periods between 1845 and 1869, and 1875 and 1885, at least 74,000 lives have been saved through vaccination in Prussia alone.

In our recent Smallpox Bulletin of the State Board of Health, we showed that the reductions in the mortality from this disease analogous to those just cited have occurred in all countries where vaccination has become general.

Attention is now called to the fact that during the seventeenth and eighteenth centuries a very large proportion of sickness and death in the navies and in the merchant service was due to scurvy, and no inconsiderable number in public institutions, hospitals, jails,

reformatories, workhouses, and many other institutions were from the same cause. By virtue of proper attention to diet, cleanliness, and habitation, scurvy has practically disappeared from among civilized peoples.

We have spoken in former articles of typhus fever. This disease, also so frequent in former times among the inmates of overcrowded hospitals, other public institutions and ships, and sometimes called ship fever, has under modern sanitary conditions, become a rarity.

Typhoid fever and cholera come in for a share of our attention, and we must say in regard to these that by attention to the drainage of soils and the introduction of pure water for domestic purposes, it has been demonstrated that these two diseases can be almost eliminated. No more striking instance of this can be cited than the remarkable reduction in the typhoid death rate in the city of Munich. In 1856 the mortality from typhoid in Munich was 2.91 per 1,000 of population. At that time the soil of the city was honeycombed with cesspools, and a large part of the water supply of the city was obtained from wells and pumps sunk in this soil. Between 1856 and 1887 the conditions of the city underwent, at several conspicuous periods, a radical sanitary reform. The cesspools were filled, and the introduction of new ones was prohibited. An elaborate system of sewers was introduced, pumps and wells were abandoned, and a pure water supply was brought from a source beyond suspicion of pollution. As a result of this, the mortality from typhoid fever fell, and in 1887 it had reached the very low ratio of 0.1 per 1,000 of population, a reduction of about 96.6 per cent. in the deaths from this disease alone.

It is a known fact that within less than one year after the adoption of approved methods for the purification of the water supply of Lawrence, Massachusetts, the death rate from typhoid fever was reduced nearly 59 per cent. and in Chicago the deaths from the disease were diminished approximately 60 per cent. within a year after the domestic water supply was obtained from a non-polluted source. What does this show to a careful observer of sanitary laws? We will let our readers, the people of our great State, answer.

What has happened as a result of the proper drainage of soils? The answer is a diminution in the frequency of pulmonary, intestinal, and malarial troubles everywhere. As sanitary methods

have progressed all of these diseases have been almost eliminated and the people made well and happy.

May we then truthfully say that these few illustrations, not to mention the advantages that have accrued from increased attention to personal *hygiene,* to diet and raiment, to the laws of disinfection, isolation, and quarantine, should serve as convincing proof that the efforts of the *hygienist* have not been in vain; that they have not only been of enormous benefit to mankind, but that with the increased store of knowledge that is constantly accumulating, they are still further capable of such benefits. Already countless lives have been saved; we are told that the longevity of the human race has been increased, and in every way the conditions under which man lives are better than they were a few years ago, and that the tendency is to still improve along sanitary lines.

To our good people let us turn and ask for their help and confidence in promulgating this great work, for in citing, as illustrations, the advances that have been made along the lines of *hygiene* and the good that has been derived from them, it is not our desire to leave the impression that the millennium has arrived; that our stock of knowledge on the subject is complete or satisfactory in all details; or indeed even that the knowledge we possess is utilized to the extent that its importance demands. A careful examination of the Iowa Death Report will reveal the fact that the preventable diseases are in excess of all the other diseases, and when we realize that the majority of all deaths is still from preventable causes, most of which are already familiar to us, it is manifest that this must be in a large measure due to an indifference on our part to put into practice even that knowledge which we already possess for their prevention. The great majority of deaths result from infection, from insufficient attention to diet, and from want of care with the regard to the temperature of the body—that is to say, they are the direct outcome of our surrounding circumstances. We consider it quite within the bounds of moderation and discretion to declare that, by the indefatigable practice of the sanitary precepts now known to be sound with regard to the prevention and management of the commoner infectious diseases, to the hygiene of infancy, to diet and clothing, the death rate from preventable causes could be conspicuously reduced, and this, too, without the addition of a single

new fact to the knowledge that we already have in our possession, and which we are not using at its fullest extent.

It is but proper in this connection that we take up in detail some of the more important diseases prevalent in Iowa.

Typhoid Fever—How The Germs Are Carried. There are certain diseases, the germs of which get into our bodies through our mouths, that is, we eat or drink them. Some of these diseases are *typhoid fever, cholera, dysentery, the summer complaints of children, tuberculosis,* and *diphtheria.* We shall try, at least, to say something about the *germ* that causes *typhoid fever,* and how it gets into our food and drink, and how we may prevent the disease by ridding ourselves of this germ.

Typhoid fever, like all other diseases caused by germs, is caused by one class of germs, and one class only. No one can get *typhoid fever* by eating *cholera germs* any more than you can get *diphtheria* from *typhoid germs.* It is not known that any other animal than man has ever had typhoid fever. Since the germs of any disease must come from an animal suffering from that disease, and as man is the only animal that has typhoid fever, it naturally follows that the only way to get typhoid fever is from some person who has the disease or has had it.

We know that typhoid fever germs get into the body with food, but how do they get out? It does not often occur that germs of typhoid fever are found in the matter that the patient vomits, or spits up, but this is so rare an occurrence that it is hardly necessary to consider it. The germs are present in the blood of the sufferer, but other people do not get his blood on their hands or in their food. There are two products that come from the patient that are loaded with these germs and these are the urine and bowel discharges. In these two excretions of the body are found practically all the typhoid germs that come from the patient, and these are the causes of other cases of infection. In other words, it is from these two excretions that the germs get into food and drink.

How do the typhoid germs get into our food? What is done with the excretions after they come from the body? You will probably say that the nurse throws them into the sewer. Very true; but where do they go when they are thrown into the sewer? The

sewer must empty somewhere, and in most instances it empties into a stream, the water of which is used for drinking purposes.

It may be thought that the germs from one person would not make much difference, but here is where a great mistake is made. It is recorded that a certain town in the State of Pennsylvania, having some eight or nine thousand inhabitants, obtained its water supply from a stream that flows down from the mountains. One cold winter, while the stream was frozen, a man living on the bank of the stream was taken sick with typhoid fever. His nurse threw the urine and the discharges from his bowels on the ice on the bank of the stream. When the ice melted, the discharges containing the typhoid germs, which survive freezing for a long period of time, found their way into the stream that furnished the drinking water to the people farther down stream, and in a very short time there were over one thousand cases of typhoid fever in that town which would have been prevented had the discharges from this typhoid patient been properly disposed of and not allowed to enter the stream which furnished the water supply of the town in which this epidemic occurred. Before the ice melted there had not been a single case of typhoid fever in that town, and every one of the thousand cases came from the water into which had been allowed to flow the discharges from one man with typhoid fever. It may be known from this illustration what germs from one typhoid fever patient can do.

How often it has been said that a stream purifies itself every few miles! It does purify itself of some things, but *typhoid germs live an indefinite number of days in water,* some say from twenty-five to thirty-five days, and a stream flows a long distance in thirty days. How often we have heard people say that it is safe to put sewage into a stream, because no town uses that stream for drinking water! We know that they can never be sure of this. An interesting incident is related wherein it was said by some people that the water from the river which flowed through their town was used only by two dairymen and a vegetable gardener, and therefore there was no danger in running sewage into the stream. Yet the dairymen and the gardener sold all their products in that very town. The townspeople never considered that the water into which they ran their sewage was used by the dairymen for washing their milk utensils (and perhaps for diluting the milk), and

by the gardener for washing his lettuce and other vegetables. Thus the germs of disease were brought directly back to the town.

Is it possible for us to believe that we are safe in polluting a stream with sewage because no town uses the water from that stream for drinking purposes? The individual on the farm is entitled to protection just as much as the individual in the town. Always let it be remembered that when we pollute with disease the water used by the farmer, he may bring that disease back into the town with the products of his farm.

The Iowa State Board of Health is trying to impress upon the people and the legislature now about to convene that no sewage, no matter how small the amount, should ever be permitted to go into a stream until all the disease germs it contains have been destroyed. This can be done, though it will cost something; but we cannot get rid of disease germs without work, and work cannot be done without being paid for by some one—either the town or city, or the state must provide for the expense.

There are other ways of scattering typhoid germs besides running sewage into streams. Sometimes the nurse or other person does not throw the discharges from a typhoid fever patient into a sewer at all, but into a closet vault. Remember how the material from a closet vault goes through open ground into a well, and you will understand what happens. The germs get into the well, and the whole family may then have typhoid fever.

We will suppose that the nurse or other person did not throw the discharges either into the closet or into the sewer, but carelessly threw them out on the ground behind the house, where, as it was winter time, they froze as hard as rocks. It does not seem to injure typhoid germs materially to be frozen; when they get warm again they are as lively as ever. We will suppose that these particular germs lay there all during the winter, but in the spring when everything melted the germs were still alive and ready to spread disease. It happened that they did not get into the well or into the milk, but they did get on some food products, and thereby transmitted typhoid fever in that manner.

We now propound the question: How did the germs get to the food products? About the time that the germs were thawed out, and were beginning to double in number every hour or two, along came a fly and thought that spot an attractive one for a lunch.

Accordingly he walked over this mass of filth, collecting a supply of germs on his feet, and then came in and tracked them over the bread and butter or other food. The fly may have dropped into the cream pitcher or may have crawled on the edge of a drinking glass, thereby transmitting typhoid fever in that manner. This is one of the reasons why the fly should be "swatted."

It is now easy for us to see how typhoid fever is transmitted. We have related how we get typhoid fever; but the trouble does not stop here with us. About the time that a member of the family falls sick with typhoid fever, then some one starts to clean the yard, but the cleaner is not very careful what is done with the dirt, including the typhoid fever discharges which the nurse or other person threw out on the snow during the winter. There was a low place in the barnyard and there the dirt was dumped. Notice now how one of the cows thought this fresh pile of dirt would make a comfortable place on which to lie down. The next morning the milker milked the cow without first washing her sides and udder, and hundreds of little particles of dirt, each one loaded with germs, fell into the milk. The milk from all the cows was mixed together, and by the time the milk arrived in town for distribution among the milk customers, the typhoid fever germs had grown into many thousands. Some of the people who drank the milk became ill with typhoid fever and wondered ever afterward where and how the disease was conveyed to them.

It must be remembered now and hereafter that a recovered patient from typhoid fever is a dangerous person. The discharges from a typhoid fever patient contain typhoid germs not only while the disease lasts, but for many months after the patient is well. In some cases typhoid germs are present in a recovered patient for years after the illness is over, and such persons are termed "*typhoid carriers.*"

We wish to present a story here about some careless nurses. In this story it will be observed that it is important to wash and boil everything that comes from a sick room. The incidents related herein are real, and illustrate the importance of taking all the precaution possible to prevent the spread of this dread disease when it is once started. A few years ago there was an epidemic of typhoid fever in a certain town. One of the hospitals was very much crowded, and it became necessary to employ several extra nurses. All the nurses knew the importance of washing their

hands after handling the patients, and the old nurses had seen so many bad results from failure to observe this rule that they were very careful. Three of the new nurses, however, thought it a great deal of trouble to be washing their hands all the time, so more and more they neglected this important duty. The result was that all three of these nurses contracted typhoid fever and died. They paid the penalty for neglecting the duty that they well knew they should have performed. These nurses should not have contracted typhoid fever, neither was it necessary for these deaths to have occurred. Boards of Health are promulgating methods which if followed will prevent sickness and untimely death in many instances.

Typhoid fever can be wiped out by proper attention to neglected details—that is, by disinfecting discharges before throwing them away; by disposing of excretions only in places that are made for them; by adding *lime* to the closet vault every day to kill any germs present; by making the closet in such a way that flies cannot get into it; and by not permitting sewage to enter any stream until all the disease germs have been killed. *All these things can be done.* It will require a little effort and work on our part; but had we not better, or rather take a little extra care than run the risk of contracting or spreading to others the dreadful typhoid fever?

Cholera—Dysentery—The Summer Complaints of Children. These diseases are all intestinal diseases, and like typhoid fever are all caused by germs. The causes of some of the germ diseases of the intestine are not well understood, as so many different bacteria are found growing in the intestine that it is sometimes impossible to be sure which one is causing the trouble. Among the germs frequently found in the intestine are several that are closely related to the typhoid bacillus. In studying these three different bowel diseases, we shall study them for the purpose of showing that all excreta from human beings should be properly cared for and thoroughly disinfected before being allowed to enter any sewer, privy vault, or to be thrown on the ground, from which other persons may become infected, thereby contracting a disease which can be prevented, when proper care has been taken.

Cholera is a disease resulting from the invasion of the body by the germ discovered by Koch and known as *spirillum cholerae Asiaticae.* This spirillum, or "comma bacillus," of Asiatic cholera

is as its name implies, a curved or spiral organism, occurring most frequently as short, comma-shaped rods. It is not necessary to consider this germ from every point of view, but to study to know how to avoid being infected by it. This germ is destroyed by exposure of five minutes to 65 degrees Centigrade. It is not destroyed by freezing. According to different authorities it is destroyed by drying in from three to four hours. When in a moist condition it retains its vitality often for months, though it is probable that it becomes weakened in virulence after this time.

The structural form and cultural appearances and peculiarities are not sufficient to lead to its absolute identification by these means alone, as there is a group of other special organisms that are in many of these respects almost identical with it. It is not to be concluded then that the mere finding of spiral organisms is proof that genuine Asiatic cholera exists; but during the prevalence of Asiatic cholera, that is, when the disease is epidemic—the finding of spiral or comma-shaped germs on microscopical examination of the intestinal discharges of people with diarrhoea is sufficient to justify the opinion that the case is suspicious and should be considered as cholera until decided to be otherwise, or proven not to be cholera.

We have been informed that the most important tests in diagnosis for this comma-shaped, or cholera germ are its failure to infect pigeons when a small portion of a solid culture of it is introduced into the pectoral muscle, and the test with the serum of animals immunized against cholera, as devised by Pfeiffer. In this latter procedure, the addition of some of the peritoneal effusion provoked in a guinea-pig by inoculating it with a mixture of blood-serum of an animal immune to cholera, and of bouillon to which a small portion of a culture of the *spirillum cholerae Asiaticae* has been added, causes these organisms to become non-motile and to agglutinate together in small masses. (The reaction is analogous to that known as Widal's reaction for typhoid fever.) The absence of this phenomenon proves that the spirillum under investigation is of a different species.

Koch performed some interesting experiments along these lines. After neutralizing the acid reaction of the gastric juice and arresting intestinal peristalsis with opium, Koch succeeded in producing, in guinea-pigs to which large doses of cultures of this

germ were given per month, a condition of the intestinal canal that was pathologically analogous to that seen in cholera in man.

It was shown by the ordinary methods of inoculation that no effect is produced, as a rule. By injecting into the peritoneal cavity of guinea-pigs the result is either that suggestive of depression due to acute intoxication, when small doses are employed, or, when large doses are used, these symptoms may be followed by death with peritonitis and evidences of general infection, though the latter is not usually conspicuous.

Where is the original home of cholera, in what seasons does it prevail and what races are affected by it most? The disease is endemic (peculiar to a people or a nation) in India, where it has been known for centuries. Epidemics (common to many people; a prevailing disease) have occurred in practically all countries, in each instance their origin being readily traceable either directly or indirectly to the delta of the Ganges, the home of the disease. Between its first appearance in this country in 1832 and its last in 1873, there have been eight outbreaks of varying degrees of severity, those of 1832, 1853-54, and 1873 being most severe. In all instances the origins of these epidemics were directly traceable to imported cases of the disease. Since 1873, though the disease has frequently appeared elsewhere, there have been no outbreaks of cholera in the United States.

Epidemics of cholera are much more apt to occur in warm than in cold months, and have been known to disappear with advent of cold weather, though this is not always the case. It is more frequent in places of low than in those of high altitude.

As regards races most susceptible to cholera, according to Hirsch, the negro is more susceptible to the disease than others of the human race, while the Chinese have often shown a relative insusceptibility to it.

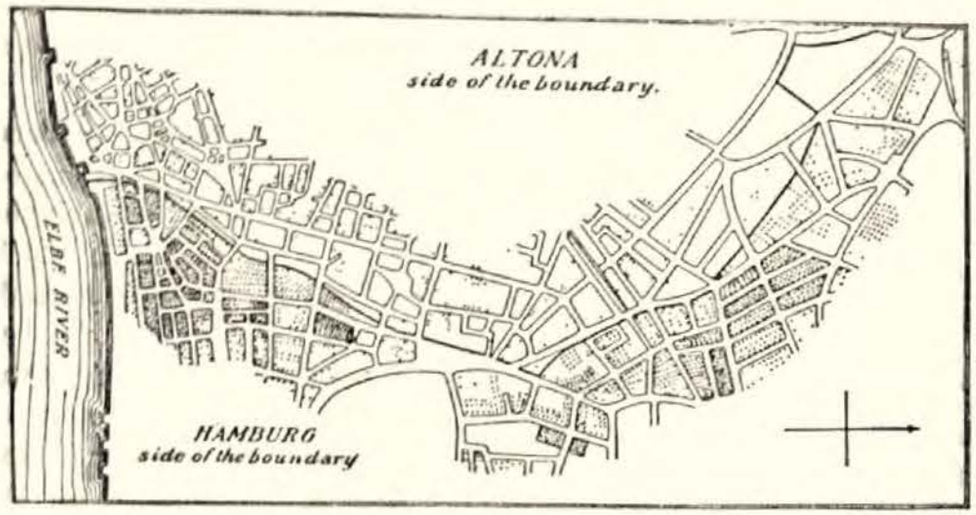
The purpose of the Iowa State Board of Health in discussing these subjects is to bring before the minds of the legislature and the people the necessity of broadening out along the lines of disease prevention. Let us study briefly regarding the mode of dissemination of cholera. Cholera is one of the *non-contagious*, infectious diseases. It is not disseminated through the air. The specific causative element is contained in the evacuations from the

bowels of cholera patients, and probably *only* in the evacuations, though it is sometimes said to be present in the vomited matters. This brings us again to the contamination of streams and the polluting of the soil with human excrement. This disease (cholera) is disseminated principally through the water and through food that has become contaminated with the evacuations of cholera patients.

With regard to the epidemic occurrence of cholera, modern opinion is at one in regarding specifically polluted water as one of the most important factors in its dissemination. In the voluminous literature on the subject numerous instances are recorded in which not only was all doubt as to the part played by water in spreading cholera removed by circumstantial evidence, but in a number of cases the actual, specific, etiological factor in the malady was discovered by bacteriological methods. No more striking and instructive illustration in this connection could be cited than the cholera epidemic of Hamburg and Altona, in Germany in the autumn and winter of 1892 and 1893. These two cities merge into one another without any definite line of demarcation. They are under distinct forms of government. Hamburg, being one of the older free cities, retains special privileges, while Altona is under the Prussian government. At the time of the epidemic, the population of Hamburg was about 640,400 while that of Altona was about 148,615. Both cities obtained their water-supply from the Elbe river. At this time, Hamburg distributed this water to its citizens just as it was pumped from the river, while Altona passed it through sand filters before allowing it to enter the city mains. The number of cases of cholera in Hamburg during the epidemic was 16,957 with 8,606 deaths, while in Altona the cases from the same disease, during the same time, numbered only 516 with 316 deaths: in other words, the number of cases of cholera in the city receiving *unfiltered* water was about 264.8 to every 10,000 of the population, while in the city receiving *filtered* water there were about 34.6 cases to every 10,000 of population; and of this number, it must be remembered, many drank the water of Hamburg during the time of their occupation in that city, for Hamburg affords employment for many residents of Altona. Since this epidemic of cholera in these two cities in 1892 one has no difficulty in determining the boundary line between Hamburg and Altona. One has but to represent graphically on a map of the two cities the location of the cholera cases (Fig. 1) when the

ramifications of the mains carrying Hamburg's *impure* water stand out in marked contrast to those of the Altona system carrying *filtered* water.

Fig. 1.



Portion of the boundary line between Hamburg and Altona. The dots indicate cases of cholera.

Since this epidemic Hamburg has instituted a most elaborate and satisfactory system of filtration, and though there has been no opportunity to test this system against cholera, its efficiency has been demonstrated in another way. Prior to the installation of this method of purifying water, the death-rate from typhoid fever in Hamburg was high, ranging from 23 to 34 per 100,000 of population; the first year after the filters were put in operation the typhoid fever mortality dropped to 18 and the second year to 6 per 100,000 of population. *These are the statistics which convey to us the knowledge that we should not only prevent the pollution of our streams by purifying sewage before it is allowed to enter them, but that all water from streams should be properly filtered and treated before being used for drinking purposes.*

Aside from the pollution of streams, cholera may be transmitted by flies and other insects that, having come in contact with the excreta of these patients, convey the germs of the disease to foods, such as milk, cooked meats, fruits and other articles taken into the mouth. Experience has taught that it is carried from places in which it is endemic or epidemic, along the lines of travel and by means of surface water-courses. This would indicate that all foods should be protected from flies and all dwelling houses should be screened from flies and insects liable to come in contact with

excreta of human beings. This means that all privies should be screened from flies, and that all vaults should be constructed so that they will be water-tight, and should have fresh lime thrown in them to destroy any disease germs which may be present. *This is very important and should be observed.*

Again all objects, the articles of body-clothing and bed-clothing, and any other articles that are soiled or have become contaminated in any manner by the dejecta of cholera or typhoid patients, are capable of conveying these diseases.

All cities and communities should ever be on the watch to prevent filth of every kind and let it be remembered that the general concomitants of poverty, such as overcrowding, filth, bad food, insufficient clothing and shelter, intemperance, and exhausting labor, especially favor dissemination of infection.

One thing can be remembered, that is, that the only natural mode of infection by cholera germs with which we are acquainted is by the way of the alimentary canal, or tract. It is needless at this place to enumerate the various ways in which this may occur. It will suffice to say that, as in the case of *typhoid fever,* one must actually swallow the specific germ of cholera that has been derived from the bowels of a patient sick from cholera. It is also appropriate to state here that in experiments on animals with a view of reproducing cholera through the administration of the specific germ by the mouth, *the acidity of the gastric juice,* by destroying the germs, has served as an effectual barrier against the growth and passage of these germs into the intestines in a living condition. To what extent similar protection is afforded to healthy human beings is impossible to indicate, but certainly, in the light of experiment, we may look upon all conditions that tend to neautralize or diminish the acidity of the gastric juice as predisposing to infection.

Now that all Europe is involved in war, we must momentarily at least consider that water-borne diseases will be prevalent there, and people emigrating from Europe to Iowa may at any moment bring cholera or typhoid fever into our midst.

It should be remembered, as has already been said, that true Asiatic cholera, which is similar to typhoid fever in its modes of transmission, is a water-borne disease; and, then with these two

diseases, we must class all dysenteries which are sometimes termed "infantile cholera," "winter cholera," "summer complaint," etc.

It is not the purpose of the Iowa State Board of Health to put out a medical book, if it were, then it would be appropriate to discuss these allied diseases, but as the factors that influence their transmission are largely the same as in the cases of typhoid fever, and as water is the most common of all foods, it becomes the duty of all persons to know that a polluted water is extremely dangerous at all times, and like a volcano may send forth its death-dealing powers, thereby destroying lives at any moment. During the year 1884 cases of cholera were three times brought in ships to England, but no spread of the disease occurred. The same thing occurred again in the two next following years. In 1890 a recrudescence of cholera advanced from Persia and Central Asia, culminating in the infection of Hamburg and Altona on August 23, 1892.

The mortality in Europe during the gradual extension of the disease westward in 1892 was very great. Two days after Hamburg and Altona were declared infected, three cases of cholera from Hamburg arrived in London, and by the middle of October quite thirty cases had been brought to this country; but in no instance, so far as is known, did the disease extend to any person other than those arriving from abroad. This of course was due to the activity of the health authorities in isolating at once all of these infected cases, thereby preventing the disease from spreading to others.

As reference has been made to the outbreak of cholera in Hamburg and Altona, in Germany, in the autumn and winter of 1892 and 1893, we find here a most excellent illustration of the value of sand filtration, and of the danger of using polluted water-supplies. Hamburg's unfiltered water came from above the city, while Altona had to depend upon water which, before being filtered, had received the entire sewage of more than three-quarters of a million people. Here is where we wish to impress upon the people of our State and our legislature that something must be done to prevent the pollution of the streams of this country. We have said that cholera and typhoid fever are likely to occur in Europe in epidemic form, and may be transported to the United States, as it has been in other countries.

In the illustration of Hamburg and Altona, the initial specific

pollution of the river-water was traced back to Russian emigrants, herded in barracks on one of the wharves pending *their embarkation for the United States.* At the time of the outbreak, there were on an average, about a thousand of these people on hand all the time. Many of them came from districts in Russia which had been and were then suffering severely from cholera, and all were well supplied with dirty clothing and blankets, some of which they washed while they were being detained. It is believed that among the thousands that had arrived, there must have been some mild cases of the disease, or at least some convalescents with cholera germs still in their evacuations two or three weeks after recovery. All of the sewage matters of every description from these people were discharged directly into the river at the wharf, which became alive with germs and were transmitted direct into the water mains of Hamburg, while Altona filtered the water before pumping it into its water mains. As has been stated both these cities obtained their water-supply from the river Elbe.

As has been stated, cholera is epidemic in India, where it has been known for centuries, and so long as the natives are faithful to their religion and to the observance of old-established customs, just so long will that country supply the rest of the world with occasional infection. Considering the extreme conservatism of all classes of East Indians and the natural reverence of the Hindoos for holy places, it may be safe to predict that before any marked change for the better is accomplished, the rest of the civilized world will have advanced so far in insanitary affairs that cholera will be feared no more than some of the minor ailments. As illustrative of what sanitary reform in India would have to encounter, the following extracts from the report of Dr. Simmons, quoted by Professor Mason, will be found of intense interest. It may be stated by way of explanation that Orissa, mentioned hereafter, is a province covering more than 24,000 square miles, every part of which is holy ground. Every town contains consecrated land and is filled with temples, and every little hamlet has its shrine. The quotation follows:

"The drinking water supply is derived from wells, so called 'tanks' or artificial ponds, and the water courses of the country. The wells generally resemble those in other parts of Asia. The tanks are excavations made for the purpose of collecting the surface water during the rainy season and storing it up for the dry.

Necessarily they are mere stagnant pools. The water is used not only to quench thirst, but it is said to be drank as a sacred duty. At the same time, the reservoir serves as a large washing tub for clothes, no matter how dirty or in what soiled condition, and for personal bathing. Many of the water courses are sacred; notably the Ganges, a river 1,600 miles long, in whose waters it is the religious duty for millions, not only of those living near its banks, but of pilgrims, to bathe and to cast their dead.

"The Hindoo cannot be made to use a latrine or privy. In the cities he digs a hole in his habitation; in the country he seeks the fields, the hillsides, the banks of streams and rivers, when obliged to obey the calls of nature. Hence it is that the vicinity of towns and the banks of the tanks and water courses are reeking with filth of the worst description, which is of necessity washed into the public water supply with every rainfall. Add to this the misery of pilgrims, their poverty and disease, and their terrible crowding into the numerous towns which contain some temple or shrine, the object of their devotion, and we can see how India has become and remains the hotbed of the cholera epidemic.

"In the United States official report, the horrors incident upon the pilgrimages are detailed with appalling minuteness. W. W. Hunter, in his Orissa, states that 24 high festivals take place annually at Juggernaut. At one of them, about Easter, 40,000 persons indulge in hemp and hasheesh to a shocking degree. For weeks before the car festival in June and July, pilgrims come trooping in by thousands every day. They are fed by the temple cooks to the number of 90,000. Over 100,000 men and women, many of them unaccustomed to work or exposure, tug and strain at the car until they drop exhausted and block the road with their bodies. During every month of the year a stream of devotees flows along the great Orissa road from Calcutta, and every village for three hundred miles has its pilgrim encampments.

"The people travel in small bands, which at the time of the great feasts actually touch each other. Five-sixths of the whole are females, and 95 per cent. travel on foot, many of them marching hundreds and even thousands of miles, a contingent having been drummed up from every town or village in India by one or other of the three thousand emissaries of the temple, who scour the country in all directions in search of dupes. When those pilgrims who have not died on the road arrive at their journey's end, emaciated, with feet bound up in rags and plastered with mud and dirt, they rush into the sacred tanks or the sea, and emerge to dress in clean garments. Disease and death make havoc with them during their stay; corpses are buried in holes scooped in the sand, and the hillocks are covered with bones and skulls washed from their shallow graves by tropical rains.

"The temple kitchen has the monopoly of cooking for the multitude, and provides food which, if fresh, is not unwholesome. Unhappily, it is presented before Juggernaut, so becoming too sacred for the minutest portion to be thrown away. Under the influence of the heat it soon undergoes putrefactive fermentation, and in forty-eight hours much of it is a loathsome mass unfit for human food. Yet it forms the chief sustenance of the pilgrims, and is the sole nourishment of thousands of beggars. Some one eats it to the very last grain. Injurious to the robust, it is deadly to the weak and wayworn, at least half of whom reach the place suffering under some form of bowel complaint. Badly as they are fed, the poor wretches are worse lodged.

"Those who have the temporary shelter of four walls are housed in hovels built upon mud platforms about four feet high, in the center of each of which is the hole which receives the ordure (feces) of the household, and around which the inmates eat and sleep. The platforms are covered with small cells without any windows or other apertures for ventilation, and in these caves the pilgrims are packed, in a country where, during seven months out of twelve, the thermometer marks from 85° to 100° Far. Hunter says that the scenes of agony and suffocation enacted in these hideous dens baffle description. In some of the best of them, thirteen feet long by ten feet broad and six and one-half high, as many as eighty persons pass the night. It is not, then, surprising to learn that the stench is overpowering and the heat like that of an oven. Of 300,000 who visit Juggernaut in one season, 90,000 are often packed together for a week in 5,000 of these lodgings. In certain seasons, however, the devotees can and do sleep in the open air, camping out in regiments and battalions, covered only by the same meager cotton garments that clothe them by day.

"The heavy dews are unhealthy enough; but the great festival falls at the beginning of the rains, when the water tumbles in solid sheets. Then lanes and alleys are converted into torrents or stinking canals, and the pilgrims are driven into the vile tene-

ments. Cholera invariably breaks out. Living and dead are huddled together. In the numerous so-called corpse fields around the town as many as forty or fifty bodies are seen at a time, and vultures sit and dogs lounge lazily about gorged with human flesh. In fact, there is no end to the recurrence of incidents of misery and humiliation, the horrors of which, says the Bishop of Calcutta, are unutterable, but which are eclipsed by those of the return journey. Plundered by priests, fleeced by landlords, the surviving victims reel homeward, staggering under their burdens of putrid food wrapped up in dirty clothes, or packed in heavy baskets or earthenware jars. Every stream is flooded, and the travelers have often to sit for days in the rain on the bank of a river before a boat will venture to cross.

"At all these points the corpses lie thickly strewn around (an English traveler counted forty close to one ferry), which accounts for the prevalence of cholera on the banks of brooks, streams and rivers. Some poor creatures drop and die by the way; others crowd into the villages and halting places on the road, where those who gain admittance cram the lodging houses to over-flowing, and thousands pass the night in the streets, and find no cover from the drenching storms. Groups are huddled under the trees; long lines are stretched among the carts and bullocks on the roadside, their hair saturated with the mud on which they lie; hundreds sit on the wet grass, not daring to lie down, and rocking themselves to a monotonous chant through the long hours of the dreary night.

"It is impossible to compute the slaughter of this one pilgrimage. Bishop Wilson estimates it at not less than 50,000. And this description might be used for all the great Indian pilgrimages, of which there are probably a dozen annually, to say nothing of the hundreds of smaller shrines scattered through the peninsula, each of which attracts its minor hordes of credulous votaries. So that cholera has abundant opportunities for spreading over the whole of Hindostan every year by many huge armies of filthy pilgrims; and the country itself well deserves the reputation it universally possesses of being the birthplace and settled home of the malady."

This very interesting history only relates what is sleeping across the waters at the present time, and may be brought into the United States and even into Iowa at any time.

During 1911 steamers arriving from Italy brought cholera to the port of New York. The first case arrived June 13th and the last August 25th. According to reports of the Health Officer of

the Port 35 cases were either stopped at quarantine during the summer or occurred among suspects detained there or among recent immigrants in New York State. For the first time since 1892 there were cases in the city proper. The first case occurred in Brooklyn, 1069 Myrtle avenue, on June 30th. Bacteriological examination on July 3d showed the presence of the cholera bacilli. The patient was a woman, thirty-three years of age, who had left Naples on June 7th arrived at New York June 17th without having been ill during the voyage. She was held for ten days at quarantine as a suspect and was discharged from quarantine June 27th. As soon as the case was discovered on June 30th the woman was again removed to quarantine, where she died July 5th.

The second case, a man thirty-seven years old, was an orderly in attendance upon the cholera suspects at quarantine. He lived on Staten Island, 14 Fingerboard road, and was taken ill at his residence. He was removed to St. Vincent's Hospital, Staten Island, July 13th, for observation, and the next day developed symptoms resembling cholera. He was then transferred to the hospital on Swinburne Island, July 14th. Bacteriological examination revealed the presence of comma bacilli. The case terminated fatally July 15th. The house in which the patient lived was thoroughly disinfected and the ward in which he had been ill at St. Vincent's Hospital was quarantined and kept under observation for ten days. A police officer was stationed at the patient's residence for ten days after his removal in order to prevent anyone from entering the house during this period.

The third case was a man twenty-eight years of age, who was admitted to Bellevue Hospital July 20th with a diagnosis of typhoid fever. During the same day the symptoms became suspiciously like those of cholera, and the case was reported to the Department of Health for diagnosis. On July 22d a bacteriological examination disclosed the presence of cholera bacilli. The patient was removed to quarantine July 22d, where he recovered. The history of this case is very obscure. The man said that he had been a fireman on a collier which left Liverpool March 15th for the Azores. He then shipped to Buenos Ayres, remaining at that port two weeks, thence to Para, where he remained four days, and then to Boston, where he arrived July 1st, the ship passing quarantine with a healthy crew. On the next day he came to New York by one of the Sound steamers. Thorough precautions were taken by the department to forestall any possibility of the transmission of the

disease from this case. The Sailors' Lodging House on the East Side in New York, in which the man had stayed for a time, was disinfected, and every effort was made to trace his movements since his arrival in New York. This inquiry disclosed the fact that the patient had worked for a short time on a night steamer running between New York and Albany. This vessel was accordingly taken by order of the department to the dock at Willard Parker Hospital and thoroughly disinfected, while bacteriological examinations were made at the Research Laboratory of specimens from 51 members of the crew. These tests all proved negative and the steamer was released at the earliest possible moment.

In New York in October, 1911, it was deemed advisable, in view of the large number of foreign workmen employed in the construction of the Catskill Aqueduct in the sections within the Croton watershed, to take special measures to guard against any possible infection of the city water supply. After conferences with the commissioner of water supply, gas and electricity, the corporation counsel and the board of water supply, a special committee was formed from representatives of these departments to make and to supervise a large number of inspections on the Croton watershed. Arrangements were made to give this committee full power to take summary action to abate any nuisance that threatened pollution. For a number of weeks careful examinations were made of all immigrants arriving from supposedly infected areas and remaining in the City of New York, in order that the first symptoms of cholera might be detected.

From these convincing illustrations and in the light of past experiences, what may we expect in the near future, after the war in Europe is over and immigrants from war-stricken countries begin to rush for the United States?

THERE IS NO CHANCE TO ESCAPE CHOLERA IN THE UNITED STATES AND POSSIBLY IN IOWA, HENCE PREPARE TO FIGHT A CHOLERA EPIDEMIC.

It is only a matter of time, in the opinion of prominent and expert medical men who have visited the battle fields in France and more especially in Belgium, when cholera will make its appearance among the armies in western Europe and perhaps cross the channel into England. The men fighting in the East, notably the Austrians, have suffered from cholera, more or less epidemic, throughout the campaign, but so far as is now known there have been no cases in the West.

It must be conceded, however, that with the coming of the spring thaw in France and Belgium, the thousands of dead lying in shallow graves will render a vast field of operations highly insanitary, menacing the health of those whose powers of resistance have broken down or weakened by the strain of uninterrupted trench warfare.

It must be observed and moreover noticed carefully that the Germans have from time to time shifted forces from east to west and vice versa. In view of this it will be surprising if cholera does not follow these shifts. The Germans have been criticised for burning their dead, but even English physicians are now inclined to admit that this, after all, is the most humane method in that a body once incinerated is no longer a menace to the living.

It is to be supposed that the French and British authorities are doing all in their power to forestall a cholera epidemic, but they have not inoculated the troops as the Germans have done in the East. They have met with an enough opposition as it is in their endeavors to inoculate against typhoid fever, a procedure to which so many soldiers, supported by anti-vaccination societies and similar organizations, have violently objected.

ASIATIC CHOLERA IS LATEST MENACE TO NATIONS ENGAGED IN WAR; MOST DEADLY SCOURGE OF MANKIND THREATENS OLD WORLD ARMIES.

In view of the facts already related, is it reasonable to ask: Have the war lords brought disaster to the whole world? Let us look to the East! There comes Asiatic cholera, brought to the threshold of civilization by this last deadly act of militarism. It is not a danger alone to the armies. It is a danger to whole nations —to the whole world!

In the Austrian and Russian armies dozens of cases have been reported and the ravages of the disease have begun to take on the proportions of an epidemic. The question is being asked daily, What are we going to do?

Some one asks, What is cholera?

It is one of the deadliest scourges of mankind. It is worse than smallpox and as bad as bubonic plague. In the seventeenth century—the Black Death—it swept over Europe and killed one-quarter of the population, 25,000,000 people.

Seven times in the past century it appeared in the West and in each visit the mortality was frightful. On the appearance in the South of Europe in 1883, 250,000 people died. Before it could

be checked in the North, ten years later, 375,000 people succumbed. Of these victims over 8,000 lost their lives in Hamburg alone, where the disease found new sacrifices at the rate of 1,000 a day.

Cholera is an intestinal disease and its first symptoms are its victim's death warrant, for there is no cure. Complete recovery

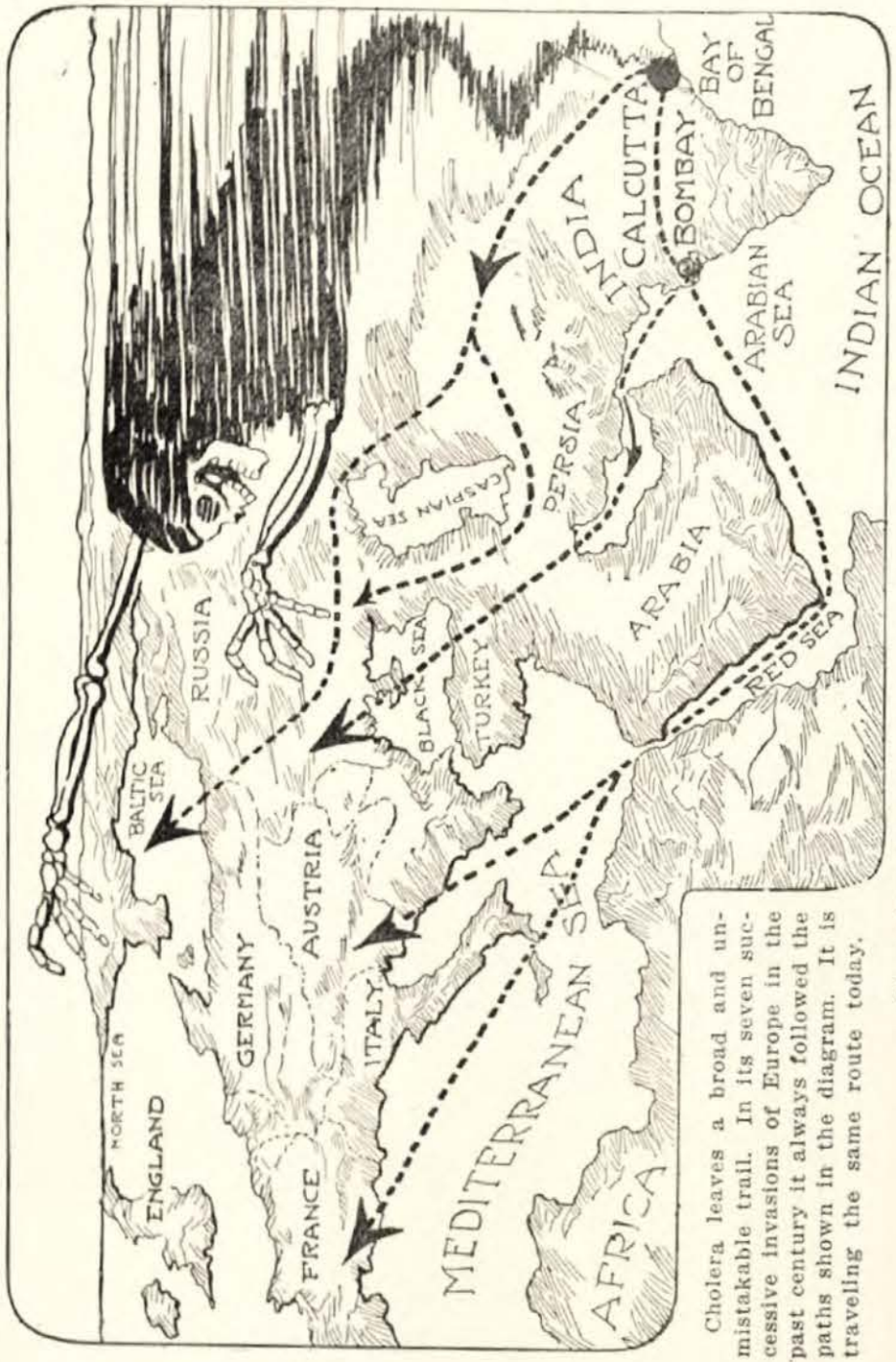


Fig. 2. The vulture hand of death spreading over Europe.

Cholera leaves a broad and unmistakable trail. In its seven successive invasions of Europe in the past century it always followed the paths shown in the diagram. It is travelling the same route today.

is rare, for the convalescent often contracts diphtheria, typhoid fever and lesser diseases. In mild cases and with hospital treatment, fifty per cent. of the victims recover, but lacking careful nursing, ninety per cent. of the patients die.

As a rule, the patient lingers for several days. At its worst cholera kills its victims two hours after the first symptoms appear. Few people realize what may happen should this dreadful disease ever invade our land. We must prepare to protect our homes and our loved ones.

For twenty years Europe has been kept free of the disease, owing to the work of Robert Koch, the famous German bacteriologist. Koch, you know, is the man who found the germ of tuberculosis. He followed up that important discovery by isolating the cholera bacillus. He showed that the comma-shaped organism was transmitted largely through water and food and in the clothes of people from infected regions. As soon as the truth of his discovery was demonstrated, barriers against the scourge were put up in all ports of the world and it has been kept in the Orient for two decades.

Now the bars are down on account of the war. The disease has again appeared and is especially dangerous to armies, as the unhealthful lives of soldiers in the field make them easy victims. In the Crimean war, for example, cholera killed more men than wounds of bullets. In the Balkan war the disease did as much as the allies in conquering the Turks. It is utterly demoralizing for its insidious attack spares no one. The healthy man in the morning may be dead at night, and before dying may infect hundreds of his comrades.

The only way of combatting the disease successfully is to isolate its victims, but one patient in escaping quarantine may expose, although indirectly, the whole of Europe. Were a cholera patient to gain entrance into Iowa, the whole state might be exposed, and, as a result, hundreds or even thousands of our citizens might succumb to this—Black Death—disease.

While the European doctors are working to prevent a panic which will mean the spread of the disease over the entire fighting zone, neutral nations are taking steps to prevent cholera within their boundaries. Italy was first to put up the bars and shortly afterward was followed by America which, remembering the 50,000 lives lost in the United States in 1873, is making a rigorous inspection of all ships from the Black Sea and the Orient.

America may, by strong measures, preevnt the landing of cholera; and again it may fail. In this connection, it is interesting to note that an American city was hardest used by an epidemic of cholera, in proportion to its population, of any city in the world during one of the cholera epidemics of the last century.

The city was Sandusky, Ohio. The epidemic spread with lightning rapidity through the town and soon caused a panic. The people left their homes in droves and took to the country roads. Bodies lay thick for miles in every direction. It is, then, to be observed that the future must be full of chances for an epidemic of cholera in this, our home country.

IMMIGRATION PROBLEMS OF THE FUTURE.

Among the many far-reaching effects of the present European war, the influence exerted on immigration assumes a prominent place. The end of the last fiscal year saw a total of 1,485,957 added to our population from this source. The influx of immigration proceeded at the normal rate until it was given a sudden check by the declaration of war in August, when the average daily landing of 3,000 or more at Ellis Island became barely that many a week. There seems to be a general agreement that the cessation of the war will see a renewal of the flood of immigrants which will surpass anything heretofore experienced. The country is alert to this possibility, and preparations to meet the expected increase are already in evidence. The proposed changes in our immigration laws will, if enacted, enforce more rigid physical requirements than any previous legislation on this subject. There is no doubt that the country needs these added safeguards. The truth of this statement is forcibly illustrated by that section of the report of the committee on inquiry into the department of health, charities, and Bellevue and allied hospitals of New York City, which deal with aliens in institutions. The committee examined, as far as practicable, every patient admitted to Bellevue for a period of thirty-one days from May 19, 1913, to June 18, 1913, inclusive. Of the 3,454 admissions during that period, 363 were aliens who had been in the United States less than five years. The physicians who examined these aliens believed that there were 185 of them suffering from diseases caused by conditions which existed prior to landing in the United States. Among these were 10 cases of pulmonary tuberculosis; 15 cases of venereal disease; 81 psychopathic cases; 2 cases of epilepsy and 2 of imbecility. This made a total of 110 patients in one month whose admission to the United States was contrary to the federal

immigration law. Taking this month as a basis, the committee estimates that in one year Bellevue hospital would receive 1,345 alien patients whose exclusion from this country is mandatory under existing federal statutes, while the total number of aliens who would be patients from causes existing prior to landing would be 2,262 yearly. This large number of physically and mentally defective aliens has succeeded in passing the examinations at entrance primarily because there are totally inadequate facilities for examining such a large number in the time allotted for the work. Now that immigration has declined to 3,000 a week, the physicians at Ellis Island have been able to make more thorough examinations. As a result of this intensive scrutiny, the precentage of defects noted has increased from the former 2 or 3 per cent. to about 7 per cent. The difference in the results obtained, leads the **state board of health** to believe that it is most advisable that a careful examination of all immigrants be made, and to suggest the advisability of urging the department of labor to provide the increased facilities which will be absolutely necessary if the physicians continue their present thorough methods of examination when immigration resumes its normal course.

WATER.

The relation which a water supply holds to the health of a community is most important. Epidemics caused by failures to supply healthful water have unfortunately been more frequent than those connected with all other municipal works.

The disease most commonly conveyed through a water supply in our country is typhoid fever. The specific germs causing it live in the bodies of those who are ill with the disease, and leave them while in a virulent condition. They are also found elsewhere in an active condition, as in milk, in oysters, and in the fecal discharges of human beings after they have been stored in cesspools for several years.

A number of cases are on record where typhoid discharges have entered cesspools and where the water supply for the house was taken from a nearby pump well. In such cases typhoid fever has been caused by the percolation of sewage from the cesspool into the well, although by natural filtration the water had become clear and palatable, as well waters usually are, but they are not necessarily free from disease germs.

We have also had typhoid epidemics from public water supplies which had been taken from apparently pure mountain streams. On

the water shed near a stream a case of typhoid fever occurred in an isolated cottage; the excreta had been thrown upon the surface of the ground, and a rain—in one case a thaw—had washed the germs into the stream and thence into the public water supply, with the result that about 1,000 persons contracted the fever and about 100 died.

It is also known that large rivers and lakes supplying a community with water have received typhoid germs, either directly from steamboats or indirectly from the shores, and that such water through a public supply entered receptive human beings and caused the disease.

Similar remarks could be made regarding all other water-borne diseases, such as cholera, dysentery and other bowel troubles. The serious cholera epidemic mentioned heretofore in the city of Hamburg, Germany, twenty-two years ago was caused by the fecal discharges into the river Elbe of a cholera patient who had just arrived from an infected district, the river Elbe then furnishing the city's water supply without prior purification. What happened then can happen in the United States and may, as we have previously said, happen in our own Iowa if a cholera carrier patient should be imported within our borders.

It may be added that typhoid fever epidemics have been caused also by milk supplies, *when the cans had been washed with polluted water, and by eating raw oysters that had been freshened by water polluted with sewage, and by flies, chiefly in places where open privies and privy vaults exist, these insects visiting first privies and then kitchens and dining-rooms, to leave the infectious germs on the food to be eaten.*

How must we, therefore, protect a city's water supply from conveying *typhoid and allied water borne diseases to the inhabitants?*

First, we must get the best waters available. These will be either surface streams, as brooks, rivers and lakes, or underground waters and springs. All waters exposed to the air, even in uninhabited regions, are subject to some pollution, despite careful protection. Cases of so-called walking typhoid may, for instance, pollute mountain streams of high purity, without our having means to discover or prevent the pollution, therefore, we must purify all surface waters which are to be supplied to a city. Any water supply coming from apparently pure streams, even if from mountains, should be purified by filtration, and perhaps treated after filtration to insure its purity and freedom from disease-producing germs. This is a safe method to pursue.

The Iowa State Board of Health contemplates issuing a water bulletin in the near future which will be full of interesting data, and it should be procured and read widely by the people of our state, in order that the necessity for purifying all waters taken from questionable sources may be seen.

When a water-supply is taken from underground sources, with ordinary care in their selection, we are well secured against a pollution by disease germs. In fact, where it is practicable to get such water, which is really spring water, we have the best supply from the health standpoint. Most cities of the European Continent are supplied with such ground waters.

It has been but a very few years since we discovered a practical method of destroying, quite inexpensively, the disease germs which are apt to be contained in our water supplies. It was found that the addition of *Chlorin gas* in exceedingly small quantities, but well distributed through the water, causes the disappearance of these classes of germs, to which most if not all of the disease germs belong. A large number of typhoid fever epidemics have been at once arrested by an immediate application of this treatment, and most cities in the United States are now continuously using it in connection with their present water supplies, or are prepared to use it whenever it appears advisable to do so.

Sanitary or water supply engineering has, it is thus seen, been developed to a point where it can safely guard the public health in the prevention of sickness and death from water-borne diseases; first, by a careful selection of the sources, and, secondly, by a proper treatment of the water where necessary, so as to destroy all disease germs contained therein.

SEWAGE POLLUTION OF INTERSTATE AND INTERNATIONAL WATERS WITH SPECIAL REFERENCE TO THE SPREAD OF TYPHOID FEVER.

It is not our purpose to enter into a lengthy discussion of this subject, but to present a few plain facts relative to the disastrous results of sewage pollution of interstate water supplies. It has been pointed out in bulletins issued by the United States government that there is an excessive prevalence of typhoid fever in the United States due to polluted water supplies, and remedies have been recommended which would be applicable to the correction of our sanitary defects.

The disastrous results of sewage pollution of interstate and international water supplies have been fully discussed in former

United States reports and bulletins, covering the drainage area of the Great Lakes. These bulletins further discussed the excessive prevalence of typhoid fever in the United States, the relation of typhoid fever to pulluted water supplies, and the remedies which would be applicable to the correction of our insanitary conditions.

The study of the Missouri river was begun upon the request of Dr. S. J. Crumbine, secretary of the State Board of Health of Kansas. The sanitary authorities of Kansas, Nebraska, Missouri and Iowa had considered with apprehension the rapidly growing pollution of this great interstate waterway. Some effort was made to secure joint action by the states interested, and several meetings were held and resolutions passed. In 1911, the Surgeon General, Public Health Service, was requested to detail an officer to cooperate with a commission appointed by the governor of Kansas in a sanitary survey of the river. Dr. Allan J. McLaughlin of the United State Public Health Service was detailed for the work, and he began in April, 1912.

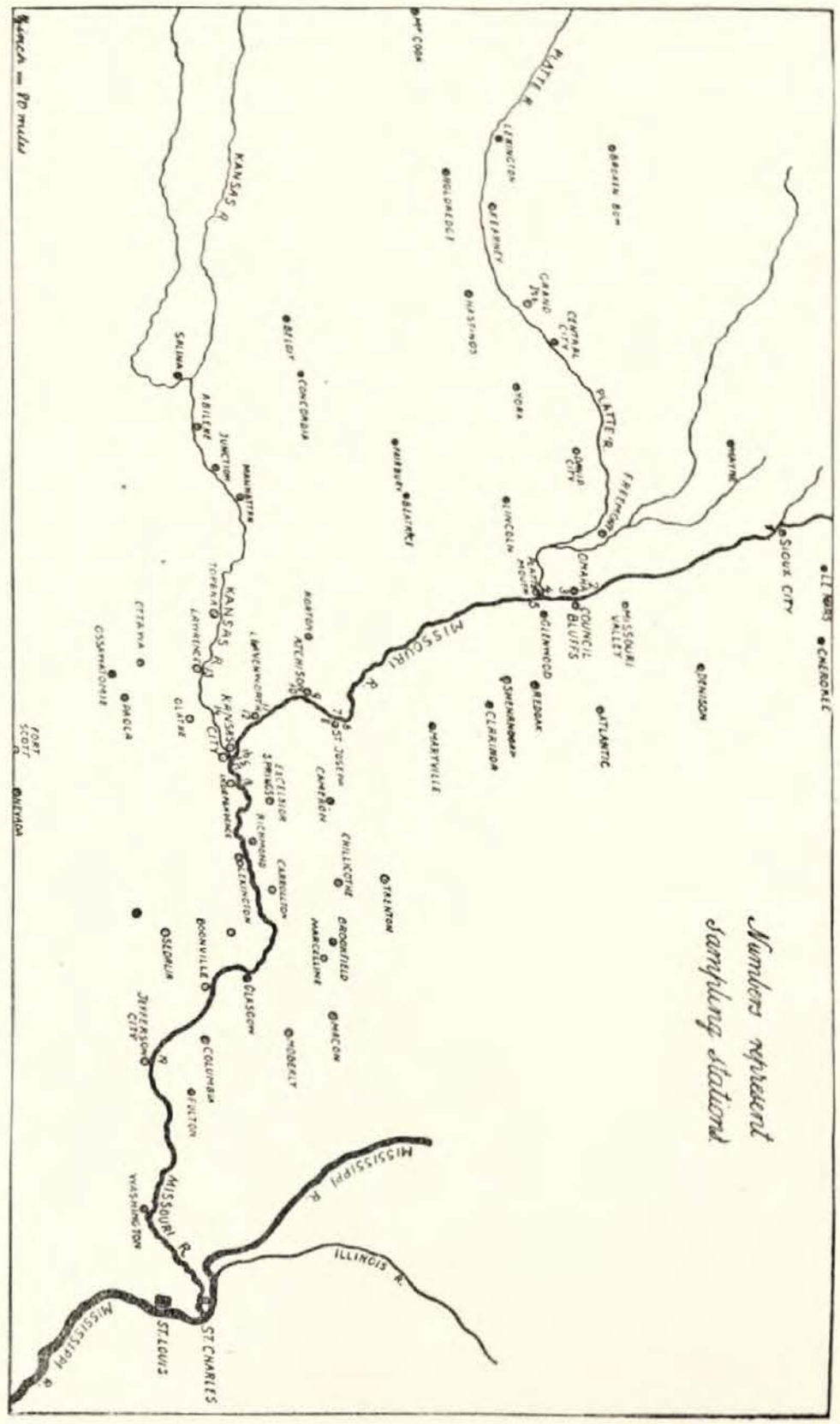
It was deemed wise to attempt to secure the cooperation of various forces, state boards of health, state universities, and municipal boards of health. This was especially desirable because of the federal appropriations being limited, which precluded any large expenditure of money by the Public Health Service.

The cooperation secured is evidence of the public spirited attitude of the officials and their willingness to assist in such a work, even at considerable personal sacrifice. The demonstration that municipal, State, and Federal officers can work harmoniously is in itself an object lesson of value, showing what may be accomplished by such cooperation at a very low cost.

Obviously, the most important part of the river from the standpoint of sewage pollution was that portion from Sioux City to its mouth, and it was decided to confine these first studies to this part of the watershed.

It should be here observed that all the investigative work undertaken by the United States Public Health Service is in the form of sanitary surveys and never in the line of single water analysis. The single water analysis as has been the custom in the past has been found to be unreliable and untrustworthy, hence a careful study of the plans herein followed will be not only instructive but interesting.

The cooperative plan outlined for the study of the pollution of the Missouri River was as follows: First, a sanitary survey of the



Map 1.—Watershed of the lower Missouri River showing sewered towns and sampling stations.

important cities and towns on the river; second, examinations of samples of the water of the river taken daily for a period of at least two months, the sampling points to be fixed above and below the principal sources of pollution and in the mouths of tributaries. In order that the results might have comparative value it was deemed wise to have the examinations made simultaneously over the entire area. The advisability of a long series was appreciated, but there were insuperable difficulties in the way of securing examinations for a longer period than two months. Inasmuch as a year's daily examinations were not feasible the months of June and July were selected. These months have certain advantages in the Missouri Valley, including a period of very high water with probably the maximum pollution, as evidenced by bacterial counts.

The following is a list of the laboratories, the names of the officials extending the courtesies of these laboratories, the names of the bacteriologists who did the work, and the points from which samples were taken:

Name of Laboratory	Sampling point	Officials extending the courtesy	Bacteriologist
Bacteriological laboratory, Iowa State Board of Health, Iowa City, Iowa.	(1) Missouri River, Sioux City, Iowa, below city sewers.	Dr. G. H. Sumner, secretary State board of health; Prof. Henry Albert, director of laboratory.	Professor Albert
Laboratory of Omaha city department of health.	(2) Missouri River above city's sewers; (3) Missouri River below city's sewers.	Dr. Ralph W. Connell, commissioner of health.	Dr. Millard Langfeld.
University of Nebraska department of bacteriology.	(4) Missouri River at Plattsmouth; (5) Platte River at Plattsmouth.	Dr. E. Arthur Carr, secretary Nebraska State Board of Health; Prof H. H. Waite, University of Nebraska.	Professor Waite; Mr. John J. Putnam.
Laboratory of city of St. Joseph.	(6) Missouri River above city; (7) Missouri River below city; (8) Missouri River below packing plants.	Col. J. A. Corby, president board of health.	Dr. E. A. Logan.
Water and sewage laboratory, State board of health, University of Kansas, Lawrence, Kansas.	(9) Atchison, above city; (10) Atchison, below city; (11) Leavenworth, above city; (12) Leavenworth, below city; (13) Kansas River at Lawrence; (14) Kansas River at Bonner Springs; (15) Kansas River at Kansas City.	Dr. S. J. Crumbine, secretary State board of health.	Professor Sherwood; Professor Young; Miss Greenfield.
Laboratory department of health, city of Kansas City, Mo.	(16) Kansas River at Kansas City; (17) Missouri River above mouth of Kansas River; (18) Missouri River below Kansas City sewers; (19) Missouri River at Independence, Mo.	Dr. W. S. Wheeler, commissioner of health; Dr. H. Delamater, assistant commissioner of health.	Dr. J. R. Vanatta.
Bacteriological laboratory, Missouri State Board of Health.	(20) Missouri River at Jefferson City, Mo.	Dr. Ernest F. Robinson, President State board of health; Dr. Frank B. Hiller, sec'y State board of health.	Dr. Murray C. Stone

In the collection and shipping of samples other public-spirited individuals assisted very greatly. Each laboratory received and examined daily samples from one or more sampling points.

Dr. Delamater furnished the containers and supervised the collection of samples at Kansas City, Mo. The State Board of Health of Kansas furnished containers for the collection of samples at Lawrence, Bonner Springs, Kansas City, Kans., Leavenworth and Atchison, and the collection and shipment of samples were supervised by the local officials. The interest and cooperation, involving personal sacrifice, evidenced by Dr. McKee, of Leavenworth, Kans., and Dr. F. L. Cook, of Independence, Mo., were especially noteworthy. Dr. Murray C. Stone collected the samples at Jefferson City, Mo. The collection of samples at St. Joseph, Mo., was made possible through the hearty cooperation of Col. J. A. Corby, president of the board of health. Dr. E. Arthur Carr, secretary State Board of Health of Nebraska, arranged for collection, shipment and examination of two samples daily from Plattsmouth.

Dr. Ralph W. Connell, commissioner of health, Omaha, Neb., took a personal interest in the work and secured the collection and examination of two samples daily at Omaha. *The Iowa State Board of Health agreed to examine one sample daily from Sioux City, and Dr. E. W. Meis, of Sioux City, supervised the collection and shipment of the sample.*

The examination of samples was made in the laboratories listed above, and the government official, Dr. Allan J. McLaughlin, of the United States Public Health Service, who had charge of the work says that he feels indebted, not officially but personally, to the bacteriologists who gave their time to this work and whose only compensation was the assurance that they were doing something for the general welfare of the people.

In order to secure uniformity of procedure, simple rules were agreed upon and followed by the various workers. The samples were packed in ice for shipment, and although in some instances this was unnecessary, it was deemed best to make no exception, even if the time of transit from sampling point to laboratory was short.

It was decided to have the examinations cover total bacterial counts and quantitative *B. coli* estimations; the total bacterial counts to be made on agar plates grown at 37° C.; the *B. coli* tests to be made as follows:

Each sample was planted in lactose bouillon fermentation tubes, using dilutions of 10 c. c., 1 c. c., 0.1 c. c., 0.01 c. c., 0.001 c. c., etc., in order to secure a + and — in each set of four or five dilutions. The fermentation tubes were incubated 48 hours at 37° C. The *B. coli* tests were not carried beyond the isolation of typical *B. coli* colonies on litmus lactose agar plates. The amount of gas was not considered, but all tubes showing gas were plated and the combination of gas + the typical *B. coli* colony on litmus lactose agar was recorded as positive for *B. coli*. The observations of Frost[1] and other workers show that the index of error in such a calculation is not great, and that probably more than 95 per cent of such colonies are sewage bacteria of the Colon type.

The use of agar instead of gelatin, of litmus lactose agar plates instead of Endo's medium, and lactose bouillon instead of lactose bile was determined by considerations of expediency and not because these media were considered superior. In a cooperative work of this character, it was essential to select the methods which imposed the least possible additional work and which workers would carry out most uniformly.

The results of the laboratory work were collected from the workers by Past Asst. Surg. John S. Boggess,[2] and the interpretation of these results made in Washington. The total bacterial counts were averaged by months, and the *B. coli* content was estimated according to the method of Phelps.[3] This method is simple, and, for comparative purposes on the same stream, is sufficiently accurate when a large number of examinations are made. It gives by this method, in the monthly averages, and index of the relative amount of pollution at various points in the river.

THE DRAINAGE AREA OF THE LOWER MISSOURI—PRINCIPAL SOURCES OF POLLUTION.

The drainage area tributary to the lower Missouri river includes practically the entire state of Nebraska, the western third of Iowa, the northern half of Kansas, and a large part of the state of Missouri.

In a study of pollution of the lower Missouri river certain

[1]Frost, W. H.; Hygienic Lab. Bull. No, 78, U. S. Public Health Service, p. 117.

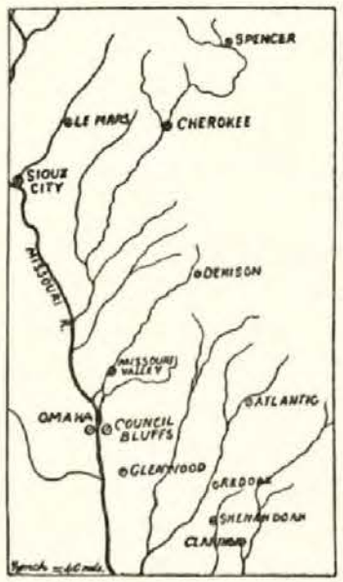
[2]Past Asst. Surg. Boggess also arranged for collection and examination of the samples at Sioux City and of the two samples at Plattsmouth. The writer wishes to express his indebtedness to Dr. Boggess for his assistance.

[3]Phelps, Earl B.: A method for calculating the number of B. coli from the results of dilution tests. Reports and papers of the American Public Health Association, vol. 33, 1907, pt. 2, pp. 9-13.

facts are prominent as having an important bearing on the subject. First, the character of the rural districts is such that considerable animal pollution is certain to reach the streams; second, the population per square mile is not excessive, and in many of the rural districts is decreasing; third, very significant pollution comes from the large cities, and the population of these cities is increasing.

State.	Persons to square mile	Rural population per square mile	Decennial per cent increase of population, 1900-1910.	
			Urban	Rural
Nebraska	15.5	11.5	18.7	+9.6
Iowa	40.0	27.8	19.9	—7.2
Kansas	20.7	14.6	39.0	+7.3
Missouri	47.9	27.6	22.3	—3.5

The rural population in Iowa and Missouri has reached beyond 27 persons to the square mile and is now decreasing. The rural population in Kansas and Nebraska is only 14.6 and 11.5 respectively; hence, the slight increase in rural population is to be expected. It may be accepted, judging by the experience of older States, that the rural population per square mile will not exceed 30, certainly not for many years.



MAP 2.—Missouri River drainage area in Iowa showing sewered towns.

The large rural population with the great number of domestic animals is sufficient to contribute to the streams draining this area a considerable degree of pollution, especially when heavy rains and thaws wash the surface pollution into the streams.

This rural pollution may be accepted as inevitable. On the other hand, the pollution of the streams from urban sources is very great, is constantly increasing, is susceptible of control, and should be very carefully controlled.

In addition to the pollution of the Missouri river by rural communities, there is a certain amount of pollution from tributary streams receiving sewage from cities or towns of less than 5,000 population. If these towns are situated at considerable distance from the main river, they may be considered in the same category as rural pol-

lution, because of the effect of stream flow on the small amount of sewage contributed. Besides the rural pollution and distant pollution from these small cities, there remains to be considered the most important class of contributors to the pollution of the Missouri, viz, the large cities. Some of these cities are growing rapidly, and in addition to the sewage, have packing plants which discharge large quantities of wastes into the Kansas and Missouri rivers.

Map No. 2 shows the urban population in Iowa which is tributary to the Missouri river above Kansas City. The distances from the Missouri river and populations are as follows:

City, town or village	Population, 1910	Approximate distance from Missouri River	City, town or village	Population, 1910	Approximate distance from Missouri River
		Miles			Miles
Le Mars	4,157	25	Missouri Valley	3,187	20
Cherokee	4,884	75	Atlantic	4,560	90
Sheldon	2,941	55	Glenwood	4,052	15
Spencer	3,005	125	Red Oak	4,830	60
Sioux City	47,828		Clarinda	3,832	60
Council Bluffs	29,292		Shenandoah	4,976	60
Denison	3,133	50			

On the Nebraska side of the Missouri there is practically no urban pollution between Sioux City and Omaha. The Platte river drains a very large territory, but its urban population is small, and considerable distances intervene between these cities and the Missouri river.

These two maps Nos. 1 and 2 and the other information connected with them have been taken from the United States Government Reports and are, therefore, very reliable.

A careful examination of the foregoing will illustrate what is actually taking place all over Iowa as regards the pollution of our streams. In view of all the facts and circumstances which have been herein related, it should be noted that the sewage of small urban communities of less than 5,000 population cannot have a marked effect upon the character of the Missouri river water for more than a few miles beyond the sewer outlets, but this gives us no assurance that we should continue to pollute our streams indefinitely without beginning now to treat all sewage before it is allowed to go into our streams. Notwithstanding the above statement, yet at Jefferson City, 240 miles below Kansas City and 54 miles below Boonville (which has less than 3,000 people tributary to sewers), a B. coli content of from 150 to 300 per cubic centimeter was found. The most logical explanation, and an inference which is unavoidable, is that the high B. coli count in Missouri river water is due largely to the washings from the rather populous watershed. "Populous" is used here to indicate not only human beings per square mile but also cattle and hogs. Independent of city sewage, the tributary streams and the Missouri itself receive in flood times the washings of manured fields, grazing lands, and hog farms, *as well as the washed-out contents of privy vaults, cesspools, and small sewerage systems.* The latter mentioned are those to be feared, for from these we may expect to contract typhoid fever, cholera, dysentery and bowel diseases.

We will give in the following, two sanitary surveys of two of Iowa's very important cities, *and it should be known that the Iowa State Board of Health now believes that the analyzing of water alone and occasionally, say two or three times a year, is of very little value, for the surroundings should be examined and if the water is liable to become infected, then it should be filtered and treated in order to be sure all the time that all disease-producing germs shall have been destroyed before the water is used for drinking and culinary purposes.* The two cities selected are Sioux City and Council Bluffs.

SIOUX CITY, IOWA.

Sioux City, Iowa, grew from a small city of 7,366 in 1880 to 37,806 in 1890. It suffered a loss in the next decade, registering 33,111 inhabitants in 1900. During the past decade the city has had a substantial growth, and in 1910 had a population of 47,828. The importance of Sioux City as a center in interstate traffic may be expected to increase. There will also be an increase in the amount of pollution which it contributes to the Missouri river.

SEWERAGE SYSTEM.

The sewage of Sioux City is dicharged into the Missouri river by four principal outlets at the foot of the following streets: Water street, Nebraska street, Virginia street, and Court street.

The largest discharge is at Court street, and this amounts to about 40 per cent of the total sewage discharged directly into the Missouri. The Floyd river receives sewage from three outlets of the city sewerage system and also the sewage and wastes from the stockyards. The Floyd river discharges into the Missouri at the foot of Clark street, about four blocks below the Court street sewer. Sioux City is a well-sewered city, but there are more than 1,000 privies in use.

WATER SUPPLY.

The public water supply of Sioux City is from deep wells and its security from pollution is conceded. However, it is one thing to have a safe water supply and quite another to have all the people use it. As in other rapidly growing towns, there are about 1,000 shallow wells which must be regarded as questionable sources of supply.

TYPHOID FEVER IN SIOUX CITY.

Following are the number of deaths from typhoid fever occurring in Sioux City as shown by the death certificates on file at the office of the secretary State Board of Health.

	1905	1906	1907	1908	1909	1910	1911	Total by months
January	0	0	1	2	3	0	0	6
February	0	1	1	0	1	1	1	5
March	0	0	0	0	1	0	0	1
April	1	0	0	0	0	1	0	2
May	1	0	1	2	0	1	1	6
June	0	1	1	0	0	1	1	4
July	0	0	0	1	0	1	1	3
August	3	1	1	2	1	2	3	13
September	1	0	1	0	5	0	1	8
October	0	2	1	2	3	3	1	12
November	0	2	0	0	0	4	0	6
December	4	1	1	3	2	1	1	13
Total by years	10	8	8	12	16	15	10	

The rate was comparatively low in 1901, 1903, 1904, 1905, 1906, and 1907. It was excessive in 1900, 1902, 1908-9, and 1910. In 1911 the death rate fell to 20 per 100,000. Monthly statistics were not available before 1905. The high rates for 1908 and 1909 were due to an excess in December, January, and May, 1908; December, January, February, and March, 1909. In 1910 the excess was not in the winter and spring months; 1911, with a low rate, presents a typhoid curve resembling that of cities with safe water supplies.

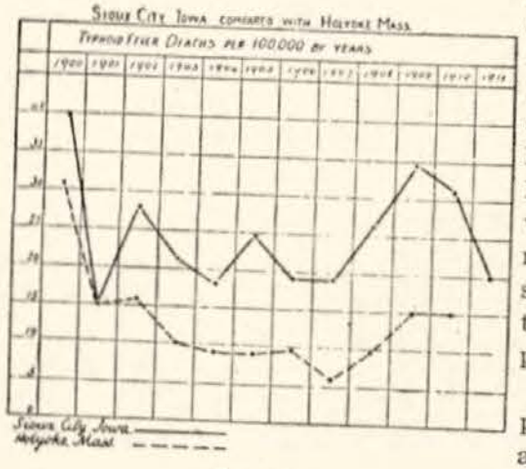


CHART 1.

If water plays any part in typhoid transmission in Sioux City, as suggested by the seasonal prevalence in 1908 and 1909, it is probably water from private wells or other questionable sources. With its excellent public water supply and the elimination of privies and shallow wells, Sioux City should effect a marked reduction in typhoid fever rates.

Chart 1 shows typhoid fever rates in Sioux City since 1900, compared with Holyoke, Mass. The Sioux City rates since 1901 are consistently higher than those of Holyoke. The public water supply of both cities is conceded to be safe. Only an intensive study of local conditions can show definitely what factors are responsible for the higher rate in Sioux City. There is no reason why Sioux City should not discover and correct these defects and bring the typhoid fever death rate down to 10 per 100,000 or less.

COUNCIL BLUFFS, IOWA.

Council Bluffs has had a steady though not rapid growth since 1880. The population in 1910 was 29,292.

SEWERAGE SYSTEM.

The existing sewerage system of Council Bluffs is not extended over the entire city. A large part of the eastern portion of the city is sewered and this system discharges into Indian Creek at Nineteenth avenue. Indian Creek discharges into the Missouri River about two miles below the Union Pacific Railroad bridge. The western half of the city is largely unsewered. The country is flat and there is probably not sufficient grade to carry sewage to the Missouri, and pumping may be necessary. The city officials are now working on this problem. There are thousands of privies in use at present, and these cannot be eliminated until the sewerage problem is solved.

WATERWORKS.

The public water supply is derived from the Missouri River. The water is subjected to short storage and treated with alum. In May, 1910, the use of hypochlorite was begun and is still being used. The public water supply does not reach all the people, and it is estimated that there are over 2,000 shallow wells in Council Bluffs.

TYPHOID FEVER.

Statistics of typhoid fever deaths in Council Bluffs are available since 1905. The typhoid fever death rate was excessive in 1909 and 1910, and in 1907 was above 20 per 100,000. In the other years the rate was low.

The high rates from 1907 to 1909 and 1910 were due to an increase of deaths in the winter and spring months.

Deaths per 100,000, typhoid fever.

Year	Deaths	Year	Deaths
1905	18	1909	28
1906	4	1910	46
1907	21	1911	13
1908	14		

Deaths, typhoid fever, by months, 1905 to 1911.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly total
1905	----	----	----	----	1	----	----	----	----	2	----	2	----	5
1906	----	----	----	----	----	----	----	----	----	1	----	----	----	1
1907	----	1	2	1	----	----	----	----	----	----	----	----	2	6
1908	----	----	----	----	----	----	----	----	----	2	----	1	1	4
1909	----	----	----	----	1	1	----	1	1	----	----	1	3	8
1910	----	2	3	3	3	----	1	----	----	----	----	----	2	14
1911	----	1	----	----	----	----	----	1	----	----	----	----	2	4
Total..		4	5	4	5	1	1	1	2	5	0	4	10	----

Chart No. 2 shows the difference between the typhoid curve for the years with low rates compared with the curve for the years with high rates. The former (solid line) has a very low rate for the winter and spring months, and the latter (dotted line) has a low rate in summer and autumn and very high rates in December, January, February, March, and April.

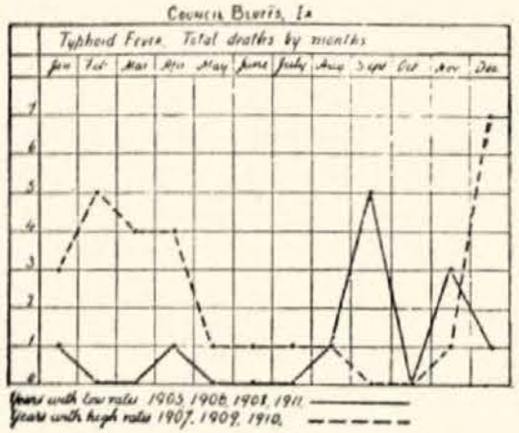


CHART 2.

The curve for the years with high typhoid rates is very suggestive of water-borne infection. After the outbreak in the winter of 1910, hypochlorite treatment of the water supply was begun. Since that time (April, 1910, to December, 1911) the typhoid rate has been very low, in 1911 being only 13 per 100,000. Water-borne typhoid in cities of this type is not entirely due to the public supply. It may be largely due to contaminated wells. There are over 2,000 of these shallow wells in Council Bluffs, and these, together with the thousands of privies, must be considered a great menace to the public health.

The treatment of the water supply with hypochlorite was a step in the right direction, and its continuance, and the gradual elimination of the shallow wells and privies will do much to insure low rates for typhoid fever in the future.

CONSIDERATIONS.

The shallow wells, privies and cesspools in the cities and towns are all a menace to the health of the people, and a single water analysis is of no value in comparison to a sanitary survey which will discover all the sources of diseases and will recommend the removal of all the causes which are promoting the preventable diseases and are producing the untimely deaths.

We have been studying the government reports and we find that which has been taking place in the Missouri river has been taking place in nearly all of the Iowa streams. There has been an undue prevalence of typhoid fever for years in every city taking its water supply from the Missouri river except St. Joseph, and St. Joseph had high rates in 1910 and 1911. The consistently high rates in winter and spring, year after year, indicate that the greatest factor in these high rates was the sewage-polluted Missouri river water, imperfectly purified. This is what is happening all over the country and sanitary surveys should be made in all communities and proper recommendations made as regards the purification of all water for drinking and culinary purposes.

Previous to 1910 the older systems of purification were ineffective in times of great turbidity or of high bacterial content. Sedimentation without the use of a coagulant is not sufficient to purify the Missouri river water in time of gross pollution, hence a careful sanitary survey will indicate what plans are to be followed in the cases of all water purification, a necessity in order to prevent typhoid fever. A single water analysis may mislead in such a manner as to deceive the people and bring on an epidemic of typhoid fever which might have been avoided if a sanitary survey had been properly made and the proper recommendations made and followed.

Purification processes depending upon sedimentation are more effective in times of great turbidity, but this higher percentage of purification is nullified by the high initial bacterial content of the untreated water, for untreated water is always suspicious when taken from polluted streams.

The united opinions of all sanitary engineers are that all streams in many instances have become open sewers. Take for example as has been stated the Missouri river. Sewage pollution of the lower Missouri river is general from Sioux City to its mouth, while it is greater in the vicinity of cities and packing plants. It is also marked at points on the river far removed from cities. At such points, after many miles of stream flow from the nearest urban sources (54 miles at Jefferson City or 23 miles at Quindaro) the B. coli content is still as high as 150 to 300 per cubic centimeter during certain months. This necessitates a high degree of purification in order to make Missouri river water safe to use for drinking and culinary purposes.

The best filter plants have not been able at times to overcome the

pollution of the Missouri, often for lack of sufficient sedimentation, but principally because of the lack of hypochlorite as a final process. The bacterial count and the B. coli content per cubic centimeter are at times so high in the Missouri river that with a filter efficiency of 98 per cent removed, a dangerous effluent remains. This would naturally lead us to treat the sewage before allowing it to enter the streams, then follow this with sedimentation, filtration and treatment in order to prevent typhoid fever.

REMEDIES IN PREVENTION.

The great primary requisite to reduce the excessive prevalence of typhoid fever in all places is to secure for all communities safe water supplies.

Good results in Omaha, Council Bluffs, St. Joseph, Leavenworth, and Kansas City, Mo., seem to have been produced by the addition of hypochlorite of lime as a finishing process to the existing purification plants. It is a question whether better results than those reported by Omaha and Kansas City, Mo., could be obtained by other methods. With a water of the character of Missouri river water, it is probable that the ideal is not reached by sedimentation and chemical treatment alone. Filtration would be an additional safeguard, and the increased cost could be further justified upon the improvement in the physical character of the water. It must not be forgotten, however, in this connection that all municipalities need an aggressive campaign to eliminate the shallow well and the insanitary privy.

We have used the above named cities as examples, for good results have been obtained in them by sedimentation and treatment alone, but it must be remembered that filtration may follow the sedimentation, then the addition of the hypochlorite. In addition to these the sewage may be treated before allowing it to enter the stream. Some pollution of streams in a populous area is inevitable. Even with the most elaborate methods of sewage treatment which are economically possible, pollution will occur in times of flood after rains and thaws and from persons navigating the stream. Sewage treatment, as a matter of fact, has been initiated usually to prevent nuisance. It is very effective for this purpose by oxidizing the putrescible material or by the nitrification process due to anaerobes in septic compartments. The effluent, however, while it is more stable and less likely to produce nuisance, has still a very high bacterial content. *So that sewage treatment is not a substitute for water purification.*

There has been much discussion in the past relative to the use of streams for the disposal of sewage. The use of streams for the disposal of sewage is an economic resource and may often be employed without detriment to others; hence, its absolute prohibition would be unjustifiable. Such use of streams is sound in principle and safe in practice when proper restrictive control is exercised. This latter expression is the one which should be carefully considered by all boards of health.

It must be understood that there are other ways of polluting streams aside from those where sewage is permitted to enter. Although prevention of all pollution is impossible, the control of pollution is feasible and necessary. The discharge of sewage by cities and towns should be under control, and disposal by dilution should be permitted, for economic reasons, up to the limit of permissible pollution, for the reason that there must be some way of aerating these forsaken substances which are in the form of sewage.

The question arises, what is permissible pollution? The permissible limit of pollution of a waterway can be fixed only after a careful study of the waterway, the uses which must be made of it and to which it is best adapted. This can be brought about in no other way than through sanitary surveys. The permissible limit of pollution, allowing a reasonable use of the stream for the purposes for which it is best adapted, must be fixed for each locality by the formulation of official standards for the waterway at that particular point. Such official standards should be made for each problem independently and separately, it being manifestly impossible to fix general standards of raw water to cover all cases without gross injustice. The acceptance of these basic facts will tend to prevent unjustifiable generalization in a problem in which each locality is a law unto itself. By allowing a reasonable use of state and interstate waters for the reception of sewage or sewage effluents, subject to such restrictions coupled with water purification as will amply protect the public health, the more intensive process of sewage purification may in many cases be avoided or limited. It should be understood that when sedimentation, filtration and treatment take place, the ordinary processes of prevention are being employed. A city may thus be saved a very great expense which could only be justified on sentimental and not on practical grounds, for purification processes for water which is

to be used for drinking and culinary purposes, should always be considered as practical and sanitary.

It is folly to undertake to do that which is impossible, and to attempt the impossible is not only to court certain failure, but, further, such attempts make difficult later efforts of a more conservative and practical nature, and it is for this reason that we again insist on sanitary surveys being made for the sole purpose of determining the needs in each community relative to purification of all water supplies, and the single water analysis or a number of water analysis cannot furnish the recommendations which are needed, for these things are only incidental in the great work of testing out purification plants and methods.

We again refer to the Missouri river, because a sanitary survey has been made of this great stream. The Missouri river at points farthest removed from the greatest sources of sewage pollution furnishes a raw water for drinking purposes which not only is unfit for drinking without treatment, but which requires very thorough treatment to render it safe. Communities owning and controlling their own water supplies should begin to take into consideration the processes for purification.

Sewage treatment is often an aid and sometimes a necessity in improving the quality of a grossly polluted water which is used as a source of water supply. Taking for example the Missouri river again, we say there is no doubt that there are points on the Missouri river where the pollution is excessive. The preliminary survey which was made shows that some of these points have probably exceeded even a liberal construction of the phrase "permissible pollution." It is impossible to generalize with justice and a further intensive survey at such points in polluted streams is necessary to determine if treatment is necessary and what degree of purification should be exacted in fairness to all concerned.

Again, we wish to refer to Missouri river for we know more about this river at the present time than any other. The condition of the Missouri river has reached the point where immediate control of pollution is necessary to prevent further impairment of the stream as an interstate source of water supply. Probably restriction of the present pollution would be unnecessary except at certain points, but further increase of this pollution should be carefully passed upon and permission granted only after most careful consideration. If the pollution increases beyond present conditions, too great a strain and responsibility will be placed upon

the water purification plants, and other means of prevention must be adopted in order to aid the purification processes which are in operation.

Even now the pollution is such that at certain points it would be an unfair adjustment of the balance between sewage treatment and water purification to expect any water-purification plant to care for such a raw water. Luckily it has not been necessary thus far to place waterworks intakes near such points.

It has been shown by recent examinations that the pollution found in the Missouri river is sufficiently gross to require attention, and many of the streams of Iowa are in the same condition. Before the introduction of "hypochlorite" as a finishing process or adjuvant to other methods of water purification, one would have said unquestionably that the raw water in the Missouri river was polluted to such an extent that its purification imposed an excessive responsibility and undue cost upon purification plants, and therefore this pollution should be greatly reduced.

These recent processes of purification have become very important. A filter plant or a purification plant of any kind unaided by "hypochlorite" is considered to be working satisfactorily if the percentage removal of bacteria is as high as 99 per cent. Yet such efficiency applied to Missouri river water with counts of 50,000 or 1000,000 leave a very dangerous effluent with bacterial counts of 500 to 1,000 per cubic centimeter. It must be conceded then that the "hypochlorite" in this instance would be almost if not quite essential, in fact, it would be best to use the "hypochlorite" at all times where such pollution is taking place or is liable to take place.

The United States government says that the introduction of "hypochlorite" has modified its views somewhat in regard to the load upon a purification plant which could be cared for economically. By the addition of "hypochlorite" to a clarified effluent, which counts of 500 or higher, a result bacteriologically satisfactory is obtained at low cost, as has been shown at Omaha, Kansas City, Mo., and other places. The writer for the government gives an opinion, however, that the pollution of raw water used as a source for water-purification plants, should be reduced to the minimum consistent with the finances of the communities involved even where the purification plant plus the "hypochlorite" seems to be able to overcome the high bacterial counts and other indices of pollution in the raw water. This would mean that the raw

water should be in as good condition as possible before entering the purification plants, then should be followed by the "hypochlorite" treatment.

The rather high degree of rural pollution—that is, washings of the drainage area in times of flood, thaws, and heavy rains—is unavoidable, but the heavy unrestrained pollution of many cities and towns on tributary streams is corrigible at least to some extent under state laws and such improvement should be effected. The State Board of Health contemplates the introduction of a bill into the coming legislature relative to the care of all Iowa streams and the purification of all water taken from questionable sources. The urban pollution and pollution from packing plants is a very great factor in the pollution of the Missouri river, as well as all or nearly all the inland rivers of the various states, and this unrestrained discharge of raw sewage and wastes into the state streams and into the great interstate waterways should be checked and placed under most careful control.

In discussing the problem of pollution of waterways, many widely diverse opinions are expressed. There are those on the one hand who speak of absolute prevention of pollution as though it were feasible to effect, while the opposite view is held by some, that the streams should receive the unrestricted discharge of sewage from urban communities. Between these two extremes lies the logical position held by students of the problem whose professional training and experience compels attention. The Iowa State Board of Health has been severely criticised because it could not prevent the discharge of raw sewage into the streams of Iowa. Such conditions have been allowed in Iowa for years, and while the State Board of Health desires to do its full duty, yet there must be additional legislation, and means furnished by the legislature before advanced work can be properly begun.

We have said that there is a condition between the two extremes mentioned above. This position is held by sanitarians and sanitary engineers in general, and consists in control of pollution, using the streams wherever possible without detriment to the public health.

The pollution of rivers, streams and lakes within a state may be controlled by state laws. The problem of the control of great interstate and international lakes and rivers is not so simple, for the reason that these great waterways receive sewage from the state streams and are used as commercial waterways. They must be

considered as a complete entity, and not piecemeal. The same laws or restrictions should apply to the Missouri river whether it be that part which separates Iowa and Nebraska, or that which separates Kansas and Missouri. The problem of pollution of interstate and international waters is so broad and affects so many interests that it necessitates for its equitable and efficient handling a central directing authority independent of local influences of prejudices. This central authority must also have the power to deal with foreign countries and adjust international differences. It is difficult to secure uniformity of law in the various states, and uniformity of procedure under such law is almost too much to be expected. To treat the problem of pollution on these great interstate or international waterways with justice and equity to all concerned, there is a necessity for federal control.

Finally, this control should include provisions that persons, corporations, or municipalities now habitually polluting an interstate waterway should be required to file within a specified period plans in duplicate showing the manner and extent of pollution. They should be required to secure a permit from the Federal authority for any extension of existing sewer or waste outlet or systems before commencing construction. The Federal requirements should be the minimum necessary for the prevention of the spread of disease in interstate traffic, leaving to the various states the right to exact more rigid requirements from municipalities within their own borders consistent with their own state laws. In other words there should be perfect harmony between the Federal govrnment and all state governments relative to the prevention of the pollution of streams and interstate waterways.

WATER SUPPLIES.

Immediate sources of water supply comprise: (1) Stored rain; (2) surface-waters, including rivers, lakes and gathering basins: (3) ground-waters, including wells, filter galleries and springs.

We cannot take up in detail all of these topics, but will give a few illustrations which may indicate some of the things that we should know. We have discussed somewhat at length all of the things that relate to water supplies, except ground-waters. In general, unpolluted ground-water of not excessive hardness is preferable to surface-water, on account of the greater exposure of the latter to the many risks of pollution; but it should be borne in mind that all sources of supply, both surface and ground-

waters, may, under one condition or another, be subject to polluting influences, and that the conditions prevailing in one locality are likely to be quite different from those in another.

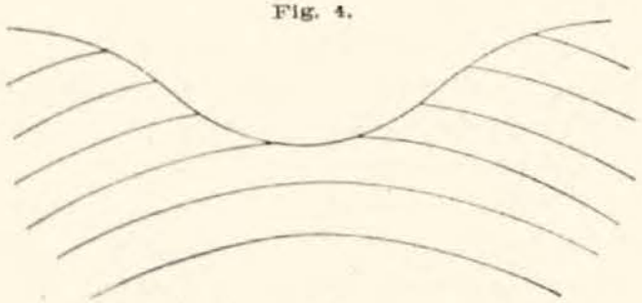
Ground-water is obtained from springs, or by sinking wells, or by constructing filter galleries.

Springs are merely local outcroppings of the water-table, and are very subject to variations in the volume of outflow. The popular mind endows springs with a remarkable and unvarying degree of purity, but they share with other waters the likelihood of becoming polluted. The possibility of contamination after and even at the point of issuance from the ground is too often overlooked, and more especially at this particular point would we call attention to the pollution of the spring or springs at Cedar Falls, where this water supply became polluted to the extent that a very serious typhoid fever epidemic ensued.

Springs are common to some localities and rare in others of similar contour, their presence or absence being determined by conditions not of the surface, but of the geological formations below. In Figs. 3 and 4 are shown in profile two depressions having the same contour, but with very different arrangement of the underlying strata. In Fig. 3 the formation favors the outcropping of springs; in Fig. 4 the opposite is the case.

Fig. 3.

Fig. 4.



Wells may be classed as dug, driven, and bored. Sometimes they are divided also into *deep* and *shallow;* but these terms as a basis of classification are of doubtful utility, since there can be no general agreement as to the line of division between them, and because of the absence of any necessarily distinctive peculiarities in the water yielded by ordinary wells of different depths. It is not uncommon to meet with general statements that the water of shallow wells is dangerous to health, and should, therefore, be avoided, and that all shallow wells should be condemned and filled. As will be seen, however, shallow wells are not necessarily dangerous, nor are deep ones always safe by reason of mere depth.

By some writers, the term *deep* is applied to wells which obtain their water from below the first impervious stratum, through and beyond which they have been extended; while the term *shallow* is applied to those which draw from what we designate as the ground-water; that is, that collected over the stratum above mentioned, regardless of the depth at which it lies. With these meanings, it follows that a shallow well may extend farther downward than another classed as deep.

The ordinary dug well is a hole dug in the soil down as far as is necessary to reach water, and lined with brick or stone, or, better, with earthenware tubes of large diameter made for the purpose in short lengths with beveled edges to secure good joints. All brick and stone linings should be well bedded in cement, except near the bottom, and should be faced with the same material throughout their upper part. The impervious lining is necessary for the prevention of the entrance of surface washings; but it is very generally the case, in some parts of the country at least, that the well is lined simply with field-stones, without cement, not for the purpose of insuring freedom from surface impurities, but to prevent the sides from caving in. With a proper lining, no surface-water can enter until it has passed through a depth of soil sufficient to insure proper filtration and purification.

A dug well should not be left open, but should be closed completely against the entrance of dirt, leaves, and animals, such as toads, moles, mice, and rats. The cover should be supported on a well-set curb, and be sufficiently tight to prevent the return of water spilled or allowed to run to waste. A manhole with a trapdoor should be provided as a means of inspection and cleaning.

For bringing the water to the surface, pumps should be used, and not buckets worked by windlass or well-sweep. In country districts it is a common practice to employ buckets made from kegs, originally used as containers for white lead. It is hardly necessary to call attention to the injury which may be caused by the use of such vessels.

The pump may stand directly in the well or away from it and connected therewith by means of a pipe running laterally and downward. The latter is the better way, as any water wasted at the pump is prevented by location, if by nothing else, from running back into the well, and, moreover, the covering of the well, if of wood, is not continually subjected to wetting, which promotes its decay. The best form of pump is the simple lifting pump, made of iron or of wood, and consisting of an evenly-bored barrel, closed at the lower part by a valve opening upward, and a piston containing another. The upward stroke of the piston, by producing a vacuum, causes the water to pass through the lower valve, and its downward stroke forces the water confined in the barrel through the upper valve, and then the succeeding strokes lift and discharge it continuously. The old-fashioned chain pumps cannot be used without more or less chance of exposure to contamination from above.

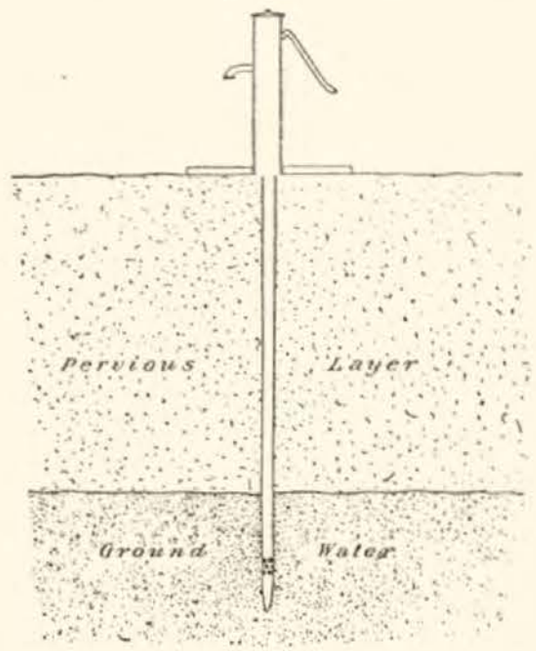
The action of the wind is very commonly employed as a labor-saver for pumping water not only from the well, but upward into reservoirs and distributing tanks. For this purpose a variety of wind-mills have been put upon the market. In this connection we might add that gasoline engines are used in many places for the same purpose as are wind-mills. These engines are very efficient and not unduly expensive.

Driven wells, otherwise known as "Norton's tube wells," "American," and "Abyssinian" wells, are made by driving iron tubes of a diameter varying from 1¼ to 4 inches, according to the needs of individual cases, into the ground until water is reached. The first length driven in is provided with a pointed perforated foot, through which the water enters the tube. When this length is driven sufficiently far, another is screwed on to it and the driving is continued, additional lengths being screwed on as necessary. When water is reached—and this is ascertained by means of a weighted string let down inside the tube from time to time—a pump is applied and the water lifted. The first that comes contains sand or fine gravel and dirt, and as this is more and more removed from below, a pocket is formed which constitutes an underground reservoir.

Bored wells differ but little from tube wells; in fact, they are practically the same except in the method of their making. They are drilled or bored through solid rock and other strata, and are lined or not with iron pipe, backed with cement according to circumstances. Their cost is much greater than that of the ordinary

driven or Abyssinian well, since the labor required is much greater. Sometimes it is necessary, after proceeding several hundred

Fig. 5.



Norton tube well.

feet with no results, to resort to blasting at the bottom, so as to shatter the rock and form waterways to the well.

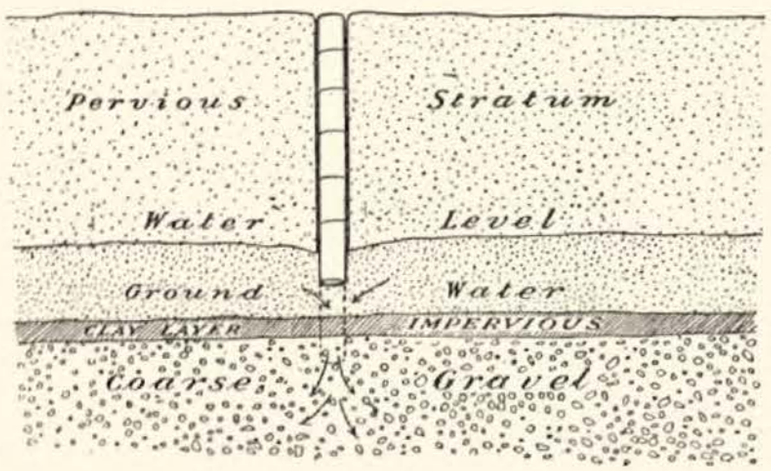
It is self-evident that wells of these two kinds last mentioned cannot, under ordinary circumstances, become contaminated with surface washings. Both forms are used very commonly not only for individual, but for public, supplies. In the latter case, they are driven in groups, or "gangs," the size of which varies according to the amount of water required. Increase in demand should be met by extension of the system rather than by over-forcing, for the latter will cause an undue lowering of the water level and tend strongly to bring water downward from the upper strata at such a rate as to preclude the purification which normally is brought about by the saprophytic bacteria of the soil.

In case of an ordinary well, the bottom should be considerably below the level of the ground-water, so that when this falls, the well will not run dry, and also because the farther the withdrawal by pumping carries the level of the well below that of the water-table, the faster will be the flow toward the well, and the greater the supply immediately available. But deepening a well for the purpose of increasing the supply sometimes has the very opposite

effect, and may even cause it to run practically dry. Suppose, for example, the impervious layer is underlaid by a thick stratum of coarse gravel, and in the process of deepening the well this stratum is entered; instead of an increase in the supply, it then may happen that the water flowing into the well finds a ready exit downward by the force of gravity into the interstices of the gravel, and the usefulness of the well is terminated. (See Fig. 6.)

Included under bored wells are those known as *Artesian*. These are bored through impervious strata until a stratum is reached in which the water is under hydrostatic pressure, sufficiently strong

Fig. 6.



How a well may be spoiled by being deepened.

to force it to the surface, or at least to a point nearly as high, the rise depending upon the height reached by the water-bearing stratum in higher land elsewhere. In Fig. 7 is shown a formation favorable to the obtaining of water by means of this class of wells. The water in the soil above the first layer of clay may be reached by sinking wells of the ordinary kinds. Below this is a second supply confined between two impervious strata inclining upward. The higher this formation extends above the level of the outlet *A* of a well sunk into it at that point, the greater will be the pressure at *B* and the higher the rise of the water. Thus, if it extends upward to *C*, for example, the water will not simply fill the tube, but will be thrown some distance into the air. In some cases, although the head developed is very considerable, the water does not come to the surface, because of the extent of leakage into the upper pervious strata of the soil.

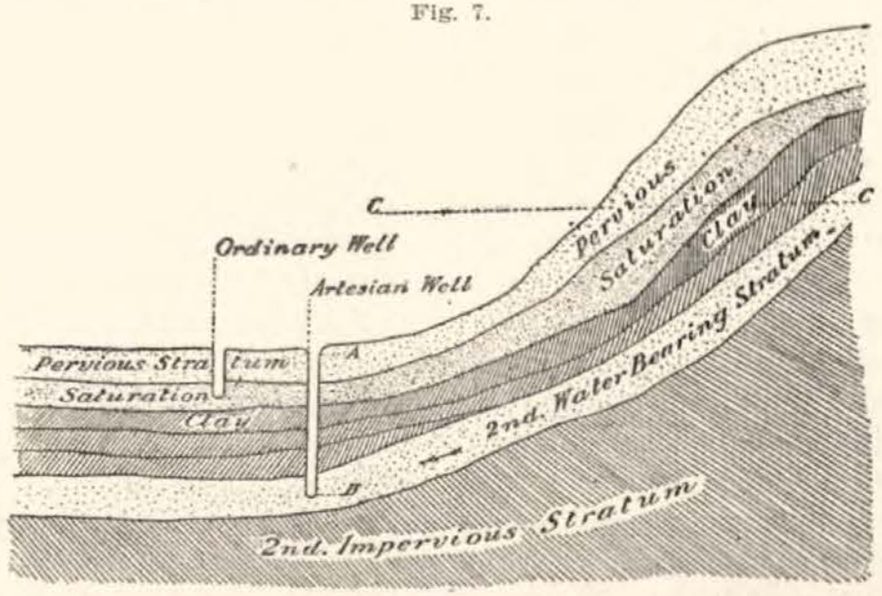
Sometimes the wells are connected with true underground rivers,

and sometimes with apparently inexhaustible reservoirs which have held the water in storage for ages. Sometimes they derive their water from fissures draining away the water of surface rivers and lakes, as is proved by the occasional occurrence in the overflow of small fish with eyes.

Artesian wells have been known in China and Egypt from very ancient times, and centuries ago they were introduced into the province of Artois (Artesium), from which their name is derived. They are exceedingly numerous in the western and southwestern parts of the United States, where they have produced enormous results in converting arid, waste lands into fertile farms. Some of them are exceedingly deep, and pass through stratum after stratum of different formations before water is reached.

Since the temperature of the earth increases 1 degree Fahrenheit for about 55 feet of depth, it follows that water from these very

Fig. 7.



Geological formation favorable to the obtaining of water by means of artesian wells.

deep wells is materially warmer than that from the upper subsoil. Distinctly hot water from deep sources is rarely fit for ordinary domestic purposes, because of the large amount of mineral matters present in solution by reason of the greater solvent power of water when hot than when cold. Thus they acquire an abundance of salts, which, taken into the body, influence its functions and act as medicines. The presence of organic matters is of importance on account of their reducing power. The sulphuretted hydrogen so common to mineral springs is due to the action of these matters on sulphates.

Irrespective of the changes wrought by increased temperature, the water yielded by this class of wells varies very widely in character. It may bear no resemblance whatever to the other waters of the same district, nor is there any reason why it should, for the conditions at the surface and at points hundreds of feet below are quite different. Moreover, one cannot know how far the water has traveled from where it originally entered the soil to the point where it makes its escape.

Of waters from four such wells sunk within the limits of the city of Boston to depths of from 870 to 2,503 feet, two were extensively impregnated with common salt and other mineral matter, one was very rich in both vegetable and mineral substances, and the fourth was rich in both these and sulphuretted hydrogen. It is questionable whether many of these so-called mineral waters which are advertised largely as containing medicinal properties are useful or not.

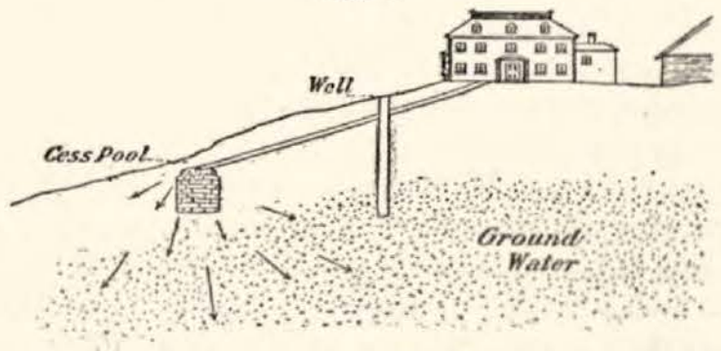
Drainage Area of Wells.—As to the amount of soil which is drained by a well, there can be no general rule. It is commonly asserted that the amount drained may be described as an inverted cone, having the bottom of the well as its apex, and a base with a radius equal to twice the depth of the well; but much depends upon the nature and configuration of the surrounding soil, and the extent to which pumping is carried. If the soil is sandy and open, the base will be much larger than if it be clayey and close. If extensively pumped, the well will drain a greater area than if the demands be moderate; in fact, the amount of water removed by pumping has a greater influence in determining the drainage area than mere depth; but other things being equal, the nature of the water-bearing stratum determines the distance to which the measurable influence of pumping is felt.

Pollution of Wells.—In general, it may be stated that, as between wells of different depths, the shallower are more subject to pollution than the deeper, because of the fact that the latter have the advantage of the greater opportunity for perfect filtration through the soil; but both are subject to pollution by unoxidized matters which enter the soil below the upper few feet in which the nitrifying organisms already referred to are found, as, for instance from leaching cesspools and leaking drains. It is a practice only too common, even on estates of considerable size, where the excuse of limited area cannot obtain, to locate the well and the cesspool very near together. To avoid the necessity of having to remove the

content of the cesspool as occasion demands when this receptable is made water-tight, and to avoid the expense attending this kind of construction, the bottom is generally left open, so that the house sewage may drain away into the surrounding soil. Connection between the cesspool and the well may take considerable time or may occur quickly, but, once established, contamination goes on uninterruptedly. Often it happens that the direction of the flow of the filth through the soil is wholly away from the well, and contamination may never occur; but this is a point that can never be determined in advance.

It is a common belief that, if the well is located in higher ground than the cesspool, there can be no danger of pollution of its water. This, however, is a most fallacious proposition, for it is not so much the location of the outlet of the well that determines the possibility of pollution, as the relative position of the cesspool and the point where the water enters the well. In Fig. 8 is illustrated the manner in which the supply yielded to a pump placed at a point considerably above the location of the cesspool is polluted directly by the liquid filth issuing from the latter. Again, the geological formation may be such that a cesspool on higher ground than the nearby well will have no influence on the purity of the water. Thus, a ledge of rock may crop up between them, as shown in Fig. 9, and divert the flow of polluting matters away from the well.

Fig. 8.

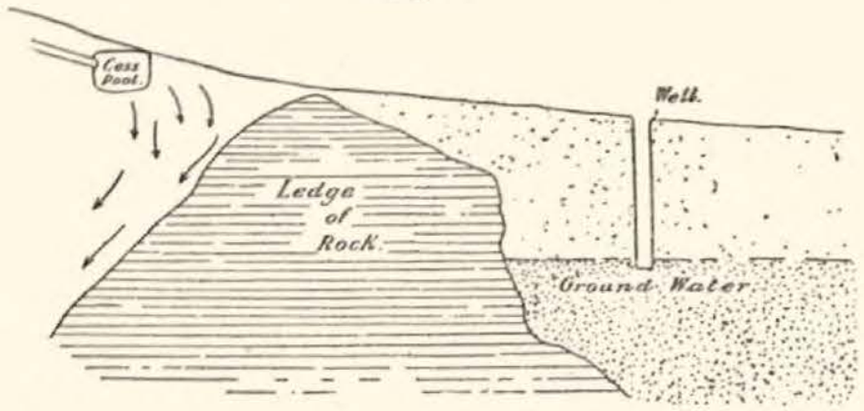


How a well located on high ground may be polluted by the contents of a cesspool lower down.

In locating wells and cesspools, property owners not infrequently lose sight of the fact that, while they can govern the disposition of the surface of their respective estates, the conditions that obtain in the soil below are quite beyond their control. In consequence, they may attempt to guard against pollution of their own water-supplies by their own excretory products, without regarding the possibility of contamination by those of their neighbors.

The water of newly dug wells is often of such a character as to lead to the perhaps false conclusion that it is probably polluted by

Fig. 9.



How a cesspool located on high ground may fail to pollute a well lower down.

sewage. It is generally turbid, and may, on analysis, yield results which, in case the analyst has not full information concerning it, may seem to warrant a condemnatory report. It may yield figures indicating a high content of organic matters, which may disappear as the use of the water becomes established. It may even show undeniable evidence of the presence of human wastes, for those engaged in the digging and the stoning may be more interested in the completion of the work than in the perfect purity of the supply, and may be disinclined to go up to the surface for the purpose of relieving the calls of nature. On all accounts, therefore, it is better to await the results of a later examination, than to condemn and abandon too hastily a supply, which, within a short time, may prove to be of exceptional purity.

Very deep wells may become badly polluted by filth which gains access through open channel-ways, as fissures in rock. A good example of this is recorded in the *Sanitary Inspector* for December, 1896: "A well bored 500 feet into red sandstone drained, through fissures, all the shallow wells in the vicinity. These being of no use as wells, were then utilized as cesspools, and, draining again through the fissures, caused the well to become so foul that it had to be abandoned." Dr. A. C. Houston, in the Edinborough *Medical Journal*, November, 1894, shows how deepening a well may, in a similar manner, cause its ruin. A well of pure water, 114 feet deep, was deepened by farther boring to 294 feet, when its yield was then found to be impure. At a distance of 800 feet was an old quarry, into which drained the sewage of 25 persons. By fissures in the

sandstone, this reached the water stratum tapped by the extension of the well and thus spoiled the water.

On account of the possibility of contamination of shallow wells by the entrance of surface washings from above, Koch recommends that pipes be placed in position so as to reach the water stratum, and that then the wells be filled up, first with stone and coarse gravel, and toward the top, for at least six feet, with fine sand. By this procedure, the well is converted really into an Abyssinian or drive well, and is protected from surface contamination quite as well as though it had originally been driven instead of dug.

Filter Galleries.—A *filter gallery* is a large underground tunnel sunk parallel to a river or lake and near to it; it is in reality nothing more than a horizontal well. The idea which led to their construction was that in this way the river water, percolating outward from its bed through the soil, would be secured in a filtered state, and would accumulate in the underground reservoirs. Although this method of obtaining water has been attended by most excellent results, the fact remains that the water so collected comes not from the river, but from the ground on its hither side; that is to say, it is the ground-water intercepted on its way to the river. This is what takes place in the filter galleries connected with the water-supply of the city of Des Moines. This water is also treated by the "hypochlorite" process in order to eliminate any possible chances of conveying water-borne diseases to the inhabitants of the Capital City.

The water of a river does not, except under unusual conditions, percolate outward, for the silty matters deposited in its flow clog the interstices in the soil of its bed and banks, and act as a valve against its egress. The ground-water, flowing to the river, finds its way in through the silt, which gives way inward against the side of least resistance. Thus the silt yields to ingress, and is a bar to egress of water.

The fact that the flow of ground water is toward rather than away from rivers and other large bodies of water is well shown by the fact that fresh water is obtainable from wells sunk in close proximity to high water mark on the sea coast. Such may be not even slightly brackish, although sometimes they are distinctly so by backward diffusion of the salts. In the latter case, removal a short distance backward obviates the difficulty.

That the water derived from a filter gallery is not due to percolation from the river along which it lies, is further proved by the

fact of difference in composition, and especially in hardness. It might be said in this connection that the filter galleries connected with the water supply of the city of Des Moines come under this head.

CLASSIFICATION OF WATERS FROM THE SANITARY STANDPOINT.

From the standpoint of wholesomeness, waters may be divided into two classes: (1) Those free from sewage contamination; (2) those polluted by sewage.

It is not the intention to enter into a lengthy discussion of these two classes of waters, but to more particularly call attention to the direct pollution of water supplies by sewage, because of the danger of transmission of specific disease and of lowering the physiological resistance of the system. This direct pollution means the contamination of water by sewage from human beings, and this is the thing which we must fear. A river receiving human sewage is liable to transmit diseases to persons if the water is used for domestic purposes. It has been said that direct pollution may be productive of no harmful results, provided sufficient time elapses between the entrance of the sewage at a given point and the use of the water at a distance to permit of the disposal of the noxious elements by natural processes. Thus, a volume of sewage entering the upper part of a large system of public supply may not reach the distributing pipes for several months, during which time its dangerous qualities will have disappeared. Notwithstanding this fact, however, direct pollution of drinking water should be prevented by all means available on account of possible risk, and even on aesthetic grounds alone.

Indirect pollution is of far less importance than direct. In indirect pollution the organic matters of the sewage, including bacteria, are filtered through the soil, in which they are held back mechanically and more or less completely oxidized before the containing water reaches its ultimate destination. The direct pollution means the turning of sewage directly into a stream of water from a sewer without its passing through the soil or being treated in any manner whatever before it enters the stream. As to what may be called a safe limit of distance from sources of pollution, no fixed rule can be given; each case must be judged according to its circumstances. The soil as a whole has enormous capacity for purifying water of its contained organic substances and bacteria, both by mechanical retention and by oxidation processes set in motion by the bacteria which inhabit it; but all soils have not this power in an equal degree, and the conditions favorable to its exercise are not always present to the same extent. The soils most favorable for perfect filtration and purification are sandy and gravelly; in these, the water is exposed in thin layers on the individual grains to the air in the interstices. The latter should be neither too coarse nor too fine. If too coarse, the passage of water is too rapid; if too fine, not sufficient air can be present at the same time. The organisms are found only in the upper few feet of soil, and it is here also that the contained air is richest in oxygen. When the necessary conditions for filtration are present in a given soil, the water which percolates through and reaches the ground water is quite free from bacteria of any kind, even though the surface is contaminated extensively. Where the soil is very open and permeable to water or fissured, polluting materials may pass through so rapidly that they undergo but slight change on the way, while with a not too free soil, through which water passes with slowness, purification by bacterial action may be completed within a very short distance. Privy vaults and cesspools should be removed as far as possible from all wells and sources of water supply, and all privy vaults and cesspools should be made water-tight in order to prevent the soil from becoming polluted thereby contaminating wells and other sources of water supply.

It is not the purpose here to take up the subject of purification of water, but to call attention to the fact that all water should be treated if it is suspicious and is liable to transmit disease. The methods of purification which should be employed for water should embrace:

1. Chemical treatment.
2. Boiling and distillation.
3. Filtration.

We only call attention to the above without discussing the topics, but we will call attention briefly to some of the things that should be done in filtration.

FILTRATION OF PUBLIC SUPPLIES.

Filtration on a large scale is accomplished by the aid of fine sand in filter beds of proper construction, which act both mechanically and biologically. The first beds of which we have accurate knowledge were those constructed by Simpson in London, in the year 1829, which were intended primarily for the removal of dirt and

other suspended matters causing turbidity. The process was regarded at that time as a purely mechanical one, and though in course of time this kind of filtering medium came into very extensive use, it was generally believed that as carried on there was no marked chemical change in the water, and that what did occur was attributable to oxidation of organic matter by air in the interstices of the sand. This was, indeed, the veiw held generally up to the time when the extensive researches begun by the State Board of Health of Massachusetts in the summer of 1887 proved the great influence of biological agencies, although it had been shown by Meade Bolton, Heraeus, Plagge, Proskauer, and others, that filtration removed all but a trifling percentage of micro-organisms, and that water bacteria exerted some influence on the amount of the usual constituents of water.

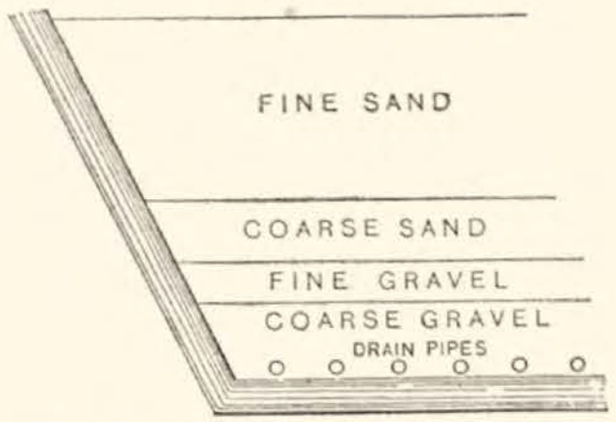
Although sand filtration of public supplies is of comparatively recent origin, its use for individual house supplies antedates Simpson by at least a century and a half, for Pontius, writing in 1685, relates that the Venetians were accustomed to filter their drinking water through layers of sand within their cisterns, in order to rid it of disagreeable odor and taste.

The first beds constructed by Simpson were broad basins twelve feet in depth with impervious bottoms and sides, containing layers of stones, gravel, and sand, which occupied half their depth. Beneath the stones were laid ordinary drain pipes, through which the filtered water was discharged. As the top layers of sand became clogged, they were scraped and renewed. The beds of the present day are constructed on very similar lines. They are virtually immense tanks of varying size, shape and construction. The walls are sometimes vertical, but more often sloping, sometimes built of stone or concrete, and sometimes consisting of ordinary embankment. Upon the paved bottom of a bed is laid a system of perforated or disjointed drain pipes leading to a central culvert or well, from which the filtered product is drawn. Above the drains are successive layers of coarse gravel, fine gravel, coarse sand, and at the top, one of fine sand from three to five feet in depth. (See Fig. 10.)

The fine sand is sharp-grained in character, such as is obtainable at the seashore, and it should not contain clay or other material of similar minuteness of particle; if present, it should be removed completely by thorough washing. As to the size of the sand particles, it may be stated generally that the finer the grain,

the better the effluent; but it should be added, the more rapidly it becomes clogged and the more frequently it needs to be scraped

Fig. 10.



Partial vertical section of one form of filter bed.

off, and finally, the more difficult it is to wash for future use. With the finest sands, the bacteria are removed absolutely, and we mean by this the germs of disease, but filtration proceeds so slowly that their use is not practicable. The most effective size of grain is a matter on which opinions differ; but whatever the size adopted, it is important that care be taken to insure uniformity, *and in this connection we wish to state that in all matters relating to filtration, the sanitary engineer of the Iowa State Board of Health, Prof. Lafayette Higgins, should be consulted.*

It is stated variously to be from a fifth to one millimeter in diameter, that is, the diameter of a sphere in volume equal to that of the grain of sand without regard to the shape of the latter. The higher figure is the one adopted by the authorities at Hamburg, Germany, and, as we have stated, the water for this city is taken from the River Elbe.

Before the water is applied to the bed, it may be advisable—and if it is from a turbid river, it will be necessary—to allow it to stand several days in a settling basin or reservoir, in order that the suspended matters may subside, and thus the too rapid clogging of the interstices of the sand with mud be prevented or retarded. Observance of this precaution will result in lessened necessity of frequent cleaning. Not only are the suspended matters lessened in amount, but organic matters in solution may be destroyed more or less completely by bacterial action, and the bacteria, too, may be diminished in number by being carried down with the settling matters with which they are in contact, and by

the death of the less hardy varieties. In the case of waters from ponds and lakes, the preliminary sedimentation proceeds *in situ* and the settling tank is not needed.

The water is delivered continuously at the surface of the bed by devices automatically regulated, and percolates downward through the various layers of sand and gravel to the outlet pipes. Except with very fine sands, the first water of the effluent is not much if any, purer than the original, but in a short time a sediment layer is formed on the surface and a slimy algoid growth occurs. This superficial layer acts both mechanically and by its contained bacteria to cause the removal and oxidation of organic matter and destruction of bacteria. The resulting effluent is quite pure and practically sterile. The filter at Lawrence, Massachusetts, for instance, removes more than 97.50 per cent of the organisms present in the water as delivered, and the reduction is still more marked at the house service pipes, where 99.17 per cent is recorded, the increase in purification being supposedly due to the fact that their necessary food material has been removed, and hence they cannot long survive. An examination of the filter systems at Hamburg, Altona, Stuttgart, London, and other places, demonstrates that the reduction in bacteria is about the same as at Lawrence, Massachusetts.

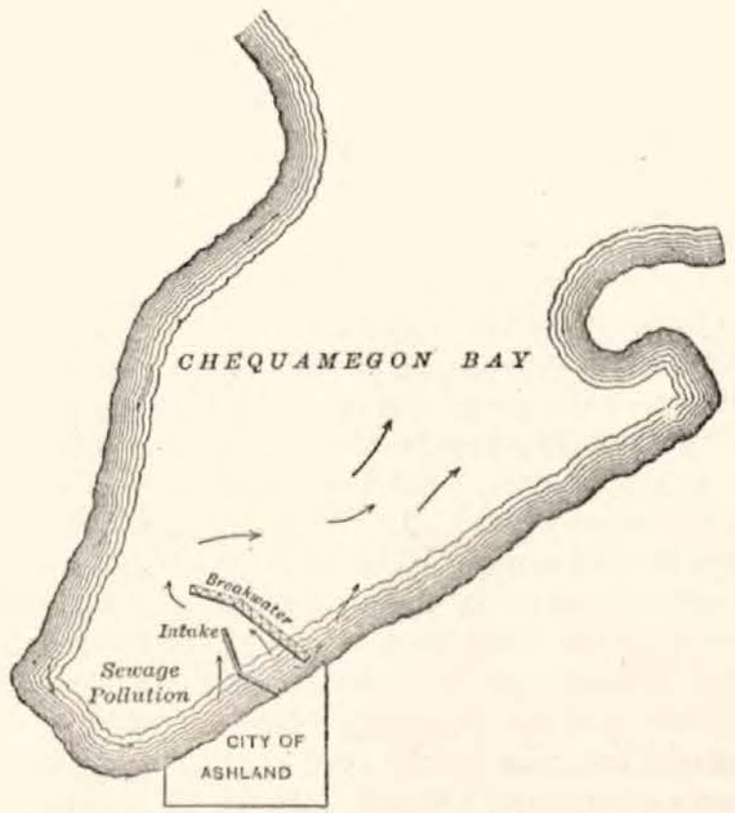
In these brief remarks we have only tried to call attention to the necessity of sedimentation and filtration, and perhaps treatment of all waters which are taken from streams and questionable sources. In connection with this we desire to say that experience has proven that waters taken from questionable sources should be protected from direct sewage contamination as much as possible, and a number of epidemics may be cited here to show that the emptying of sewage directly into the sources of water supplies has caused serious epidemics of typhoid fever. We mention the epidemic at Lausen, Switzerland, also those at Plymouth, Pennsylvania, and one at Uvernet in the Alps, and more especially to the one at Ashland, Wisconsin, in 1893-94. We speak of the latter and illustrate in the following, which shows the necessity of protecting water supplies from direct sewage contamination.

Epidemic at Ashland, Wisconsin, in 1893-94.—This outbreak is one of peculiar interest, in that, in addition to serving as an excellent illustration of the danger of using the same body of water as a place for the disposal of sewage and as a source of drinking-water, it was made the basis of an action at law, which established

the liability of water companies and municipalities in case of sickness and death caused by the distribution and use of infected water.

The city's supply is derived from an arm of Lake Superior, Chequamegon Bay, upon which the city is situated. This bay, which is about twelve miles long, and of an average width of five miles, varies from eight to thirty-six feet in depth. North of the city, and extending outward in a northwesterly direction, is a breakwater constructed for the protection of the harbor against northerly gales; and between it and the city the mouth of the water intake is located about a mile from the shore. (See Fig. 11.) The sewage of the city is discharged further to the west and south. The currents in the bay follow the course indicated by the arrows in the figure, and carry the sewage toward the breakwater and over the mouth of the intake. This condition of affairs was brought to the attention of the company by the health boards of the city and

Fig. 11.



Conditions obtaining at Ashland, Wis., prior to the epidemic of 1893-94.

state repeatedly, but without results. That the water was polluted, was evident on mere ocular inspection, for it was often cloudy or markedly turbulent. During the winter of 1893-94, typhoid fever

made its appearance in the city, and from the initial cases a disastrous epidemic developed, which led to the establishment of a model filtering-plant.

The action at law referred to above, was brought by the widow of one of the victims. In evidence, it was shown that he lived continuously in Ashland, and drank no water other than that supplied by the water company; that previous to his seizure the disease had prevailed in the city, and that the discharges from the antecedent cases had passed into the waters of the bay by way of the city sewers. The court found for the plaintiff in the sum of $5,000.

We mention others here only as a matter of reference: Epidemic at Luneburg in 1895; epidemic at Zehdenick in 1897; epidemic at Butler, Pa., in 1903; epidemic at Ithaca, N. Y., in 1903; and in this connection we mention the epidemic of Asiatic cholera at Hamburg and Altona in Germany during the summer of 1892. These are only a few of the many which we might mention, and the Iowa State Board of Health feels the necessity of making a complete sanitary survey of all of the water supplies of the state.

Attention is called here to the fact that a polluted water supply may lead to an infected milk supply, and that vegetables and other foods upon which water is placed may infect these vegetables and foods to the extent of causing an epidemic of typhoid fever, and perhaps of cholera or some other bowel disease. We cannot impress upon our readers too much that extreme care should be exercised at all times in the use of drinking-waters.

The great questions before us at this time are the pollution of our streams, the pollution of the soil, the pollution of our foods, and the pollution of the air we breathe. Sanitary engineering is the making of sanitary surveys for the purpose of eliminating the causes which produce disease. In all cities, towns and villages, the things which we have mentioned are greatly neglected, and careful surveys should be made for the purpose of eliminating as much as possible the privy vault system and the shallow wells which are so easily contaminated from surface drainage.

We now come to some important phases of railway sanitation, which, perhaps, has been in the past very much neglected. We have no means of knowing just what railroads have done along the lines of sanitation, but we have secured permission from the Illinois Central Railroad Company to embody herein a most excellent article written by Dr. A. E. Campbell, the very efficient health officer of the Illinois Central Railroad. The article herewith follows:

SOME IMPORTANT PHASES OF RAILWAY SANITATION.*

BY A. E. CAMPBELL, M. D., HEALTH OFFICER ILLINOIS CENTRAL R. R., CHICAGO.

The steamship and the railway are making the world one country. Produce is now carried from Australia to England, a distance of 11,000 miles, at less cost than was required a hundred years ago to carry goods from one end of the British Isles to the other. The construction of our transcontinental railway systems soon after our Civil War, the projection of great railway systems in Russia and continental Europe in 1873, the opening of the Suez canal in 1869 and the Panama canal in 1914, made all civilized nations near neighbors.

There were carried on the Great Lakes last year 7,000,000 people. The Chicago City Railway handles 3,000,000 persons each day. The suburban lines of Chicago handled 44,347,680 persons in the year 1913. The Illinois Central Railroad handles on an average 40,757 persons on her suburban lines each day, or 14,876,300 persons each year. This requires a vast amount of care and responsibility. The railroads leaving Chicago each employ from 45,000 to 74,000 people and the care and working conditions of this army of men should be supervised by an intelligent man. He should have supervision over the ventilation of trains, the condition of the diners, the cleanliness of the depots and toilets, as well as the ventilation of waiting-rooms, the condition of all eating-houses along the line, the condition of shops and yard offices, repair tracks, construction crews and a hundred other duties which are sure to come before him. I can assure all railroads that such a man will have all he can attend to and will be well worth what he costs many times over.

THE TRAIN.

The ventilation of trains, or at least of the day coach, is not a difficult problem if one or two points are kept in mind. A train rushing against a strong wind causes the air to pass through a train horizontally—hence, if there are openings in the end of the coach the air will pass through, as I have repeatedly proved. All end doors of all coaches should, therefore, have adjustable sash and the sash in the rear door should always be open. Every coach should have a thermometer and the temperature should be kept at a certain figure. The steel coach is coming more and more into use on account of its safety, and in the South this coach becomes very hot. I have found that the temperature in the center of this coach is from two to four degrees higher than in the ends, and as the electric fans are in the ends they are cooling the part of the coach that is cooler, anyway. There should be two oscillating fans in the center of the coach, but if four fans consume too much electricity, three English paddle fans should be installed 15 feet apart. This will distribute the air more evenly.

Spitting on trains is so reprehensible that I believe a slip should be issued by all railroads and used in the state through which they run, as

*Read before the Section on Preventive Medicine and Public Health at the Sixty-Fifth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1914.

follows: "In view of the authority vested in the state board of health you are liable to a fine of $25 for spitting, sneezing or coughing on trains without taking the precautions mentioned on this slip." On the back of the slip instructions should be given where to spit and how to cough and sneeze with the handkerchief before the face. Railroads do not like to displease their patrons, and state boards should assist and issue these in the name and by the authority of the state board and thus help to stop this disgusting practice on trains.

All coaches should have separate apartments for water and ice. I see ice handled so carelessly—slid along a platform over tobacco spit and other unmentionable filth, laborers taking up the ice with their bare hands and dumping it into the drinking-water—that I have very firm convictions on this point. I do not believe it is wise to have ice in the water in our dining service, mainly because of the methods of handling the ice. Then, again, this ice is handled by a cheap class of laborers, who are not overly clean and tidy, and I hope all railroads will abandon the placing of ice in the drinking water on trains or on diners.

There should be a folding washbowl near the pantry in all diners, but I strongly object to a toilet in a diner, as no person would care to have odor from a toilet come to his nostrils while eating. All waiters should be instructed to wash their hands before serving food, and this would be a good rule to follow in all lunch rooms. It is not very appetizing to see a waitress fix her hair and pick her nose and then, without washing her hands, hand a piece of pie or come with her finger in the glass of milk. It is because these very matters have come under my observation that I speak of them.

The carriage of tuberculous people on trains has caused much comment, and in some states attempts at legislation. We cannot deny that there is a degree of danger, but no more than from many other diseases. There is no denying the fact that diseases are transmitted from person to person and usually can be traced to excretions thrown off from the infected mouth and nose. Indeed, we are all more or less exposed to the wide-spread infection at some time or other in our lives. From the best authority we can find we fail to gather information that a person traveling on a train or steamboat reasonably well ventilated would contract consumption, even though there is consumption among his fellow passengers. There is absolutely no evidence proving such incidence of infection. Yet there may be individual cases which may point to such a possibility; but they do not prove it. Other evidence, however, leads us to suspect that the journey on the passenger coach has little or nothing to do with it. The chief physician of a great sanitarium for tuberculosis told me that it would be impossible for the common carrier to segregate those cases as there were thousands of seemingly well or healthy individuals who excrete tubercle bacilli in abundance. Indeed, I believe it would be well for common carriers to have literature on tuberculosis, or it might be well for state boards to have literature telling how the tuberculous patient should behave to protect himself and the public. For instance, the following rules might be circulated.

INSTRUCTIONS TO TUBERCULOUS PATIENTS.

The tuberculous patient must consider his own welfare as well as the welfare of those about him.

1. He should be in the fresh air as much as possible night and day.
2. He should be cheerful, look on the bright side of life.
3. He should eat only nourishing food—meat, vegetables, bread, butter milk, cream and eggs.
4. He should avoid style, dress to suit the changes in the weather, always carry an overcoat and two or three handkerchiefs.
5. He should keep his nose, mouth and hands clean.
6. He should take at least nine hours of sleep at night, and if possible a nap in the afternoon.

SOME THINGS THE TUBERCULOUS PATIENT SHOULD NOT DO.

1. He should not mingle in large crowds of people or be where there is dust or smoke.
2. He should not take tobacco or alcohol in any form.
3. He should not cough needlessly, but only when he feels he must expectorate.
4. He should not work when feeling ill.
5. He should never swallow his sputum, as it may cause tuberculosis of the bowels.

SOME THINGS THE TUBERCULOUS PATIENT SHOULD NOT DO, FOR THE WELFARE OF OTHERS.

1. He should not spit anywhere except in vessels for that purpose or in paper napkins, which should always be burned.
2. He should not cough or sneeze without covering mouth and nose with handkerchief.
3. He should not kiss any person.
4. He should not eat or drink from dishes that may be used by others.
5. He should not sleep in the same bed with another person.
6. If riding on a train he should always take a stateroom or a berth in the rear end of the car and have cuspidors and paper near him and expectorate only in them.

I believe something like this should be carried by all common carriers and I feel confident state boards could aid common carriers very materially by having something like this in such public places as the waiting rooms of depots, etc. It would be well for state boards to distribute some literature to this class so that if they travel they can be informed of the precautions they are expected to take.

Tipping on trains and on Pullman sleepers has gone so far that it has become a menace to the traveling public. There are many hotels and many more restaurants which forbid tipping. One of the leading hotels in St. Louis prohibits tipping. The McKinley electric lines through Illinois prohibit tipping on all their trains and it is time for all railroads and the Pullman people to get away from it. It is undignified and un-American and the quicker we stamp it out of this country the more we will dignify ourselves in the eyes of foreign nations.

I quote from the Washington *Post* to the effect that a young man paid three thousand dollars a year to his employer and hired several clerks and became rich in a short time. This shows how insidious a vice this is becoming. Not a man who is a member of any organization but condemns this vicious practice in the strongest terms, and railroads and the Pullman companies as well as all other corporations should bid adieu to this undignified practice.

The "butcher" or fruit vender on trains, with dirty hands and dirty linen, is a nuisance to many passengers and I believe often disseminates disease. One of our surgeons told me of a fruit vender he was treating for a specific disease, who came from the toilet room without washing his hands, handled and sold fruit to a woman with a young child. In the course of a few days the child was brought to the surgeon with a very sore eye which proved to be a gonorrheal ophthalmia. Not only should fruit venders be urged to wash their hands and keep clean but they should be examined regularly as well as all dining-car employes.

THE TRACK.

There is much agitation over track pollution by interstate carriers, and although I have watched for the number using the toilet, I was unable to determine how much fecal matter was discharged. I, therefore, selected the part of our road having the heaviest travel through the central part of Illinois. Starting at Centralia at 9 a. m., with buckets under all hoppers and traveling 275 miles with 564 passengers, there were three bowel movements and much urine. Returning at 10:30 a. m., the same distance, with 645 passengers, there were but two bowel movements and much urine. Next, the train from Chicago to St. Louis was taken. This train, leaving at 10:05 a. m., with 193 passengers, arrived at St. Louis at 6:45 p. m. There were no bowel movements but much urine. Returning, a distance of 300 miles, with 394 passengers, arriving in Chicago in eight hours, there were no bowel movements and very little urine. There is no doubt but there is much urine thrown off, but the constant jarring of the coaches inhibits the peristaltic action of the bowels in the vast majority of traveling people. The secretary of one of the boards of the Northwest told me that he has traveled from Winnipeg to New York and return without a bowel movement. Urine, as it leaves the body, is said to be aseptic, and providing typhoid germs are thus thrown off, sand or gravel is not the soil in which they can long survive, and there must be a relation between the seed and the soil. It is not wholly the one or the other with which we have to deal as practical men. It is the combination and the interaction between the two. I have also made a careful inspection of our main track over which our through trains pass between the hours of 9 and 12—the hours when bowel movements are most likely to occur. In company sometimes with state or city health officers and railway officials we failed to find any evidence of human excrement, and the railroad official explained that the constant fanning of the long freight and passenger trains dried out all human excrement. We did see an unusual amount of cattle manure, however, and as it is said that cow manure contains the colon bacilli, this matter should be seriously considered, for cattle are just as likely to drop their excrement directly into the water. It is no more dangerous for cattle to drop this on the track than beyond the fence by the right of way, but from an aesthetic point of view it would be well for railroads to prevent, as far as possible, the dropping of this occasional movement on the sidewalks of cities and villages, and I believe a false trap could be attached to the bottom of all hoppers or there could be a lock put on the flush bar or handle so that this could be flushed at points where there was no danger of sidewalk pollution. I am very sure this can be done. At some points where our sleepers stand over night there should be a bucket under all hoppers and the toilets left unlocked for the convenience of the passengers. Cattle pens along the line should be kept clean and whitewashed.

CONSTRUCTION AND SURVEYING CREWS.

I have on two former occasions called attention to this class of work, and it seems that very few railroads and scarcely any state boards in this country have taken cognizance of this important part of sanitary

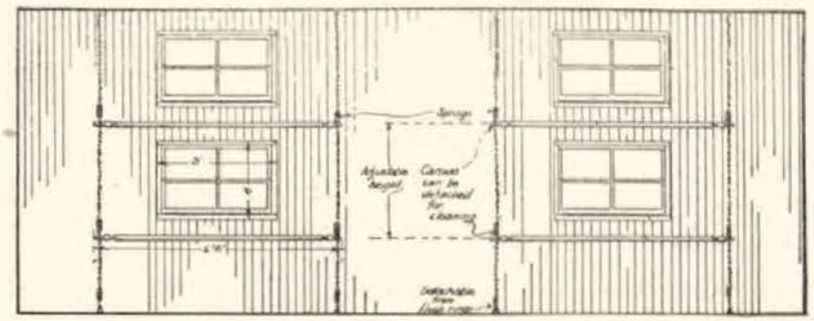


Fig. 1.—Elevation of interior side of box car showing arrangement of sanitary canvas beds.

work. When I called attention to this phase of the work—three hundred men throwing their excretions everywhere along the track while at work—I was curtly asked if three hundred was any worse than sixty passengers dropping their excretions on the right of way, when in reality not four persons drop their excretions in a journey of 300 miles. I have seen so much of this that I again call attention to it and have laid down some rules that should be followed. I have also designated the equipment that all camp cars should carry, as I often find them with no lime, no kerosene, nothing to destroy bedbugs or body lice. Often small-pox breaks out among this class of laborers. Often gonorrhea is prevalent, and it is important that separate towels should be provided for the men. I strongly recommend that these instructions be given to those in charge of camp cars:

INSTRUCTIONS TO BE GIVEN TO THOSE IN CHARGE OF CAMP CARS.

1. See that all cars are properly screened and ventilated.
2. See that all cars have the following equipment: A portable toilet; a barrel of lime; one-half barrel of powdered sabadilla; 5 gallons of kerosene; one covered garbage can; 50 pounds of sal soda; one 14-inch rattan scrub broom; soft soap; wash pans; towels and a fly-swatter for each car, and 1,000 3-grain quinine capsules. Vaccinate all men.

3. Assign a man three hours each day to scrub kitchen and dining room, and all sleeping rooms every other day, to air all bedding, to ventilate all sleeping rooms, scrub and lime all closets, and to see that fresh

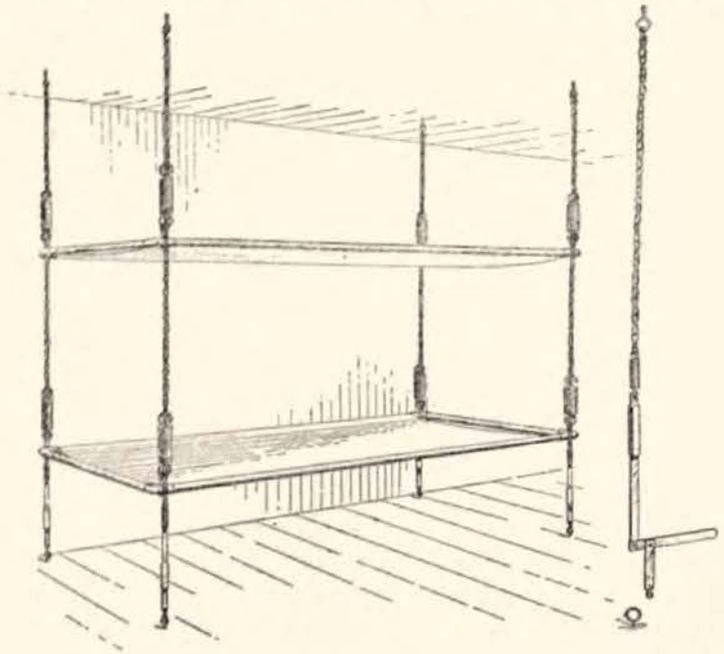


Fig. 2.—Sanitary canvas beds. Our company installed a large number of these beds in all our camp cars. They can be taken down and sunned and aired; combine simplicity with cleanliness; the canvas can be easily removed and washed.

water is provided for all the workingmen. If in a low, marshy region, 3 grains of quinine should be given twice daily.

4. See that but eight men are assigned to a car and that all cars have sanitary beds.

5. See that all garbage is destroyed or gotten rid of each day.

6. When building a privy dig a vault 5 feet deep and 2 feet wide and as long as needed, then put 6 inches of unslaked lime in the bottom and cover deposits daily with lime.

The privy vault at small railway stations is a necessity and if it has *fallen into* disrepute it is because of neglect. I am confident that it is far superior to Stiles' bucket as it is much easier to cover the excretions in a vault already made than to make a vault and then cover it after carrying this offensive mass for some distance. Dr. Smith in his *Air and Rain*, says:

"If soil affects the atmosphere, how does it happen that it is such an excellent disinfectant? Substances are purified in the air to the same extent, and in the same time as in the soil. The great amount of surface presented by the porous soil is mainly the cause of the rapid reaction, but the acid humates, and probably other substances, act chemically. There are modes of oxidizing in the air beyond the power of ordinary oxygen; one of these is by means of nitrogen oxids and another by ozone. But even these require great time and space. If we throw sulphureted hydrogen water or its compound with ammonia on a few inches

of soil it passes through, oxidized in a few minutes. We can obtain such action in the air only in great volume, although in the end the work done may be better for its purpose. It is, however, possible to overload even the porous soils which oxidize the most rapidly; that is, it is possible in a given case to have more organic matter than admits of oxidation in a certain time and putrefaction is the first result."

Now if soil is used freely, say three times as much soil as excreta, this putrefaction will soon disappear and, indeed, may be prevented, as I have repeatedly demonstrated. The plan we have adopted, and which I can recommend, is to dig a vault 5 feet deep, then put 6 inches of pure, unslaked chloride of lime in the bottom. Save all the earth removed from the vault and add this each day or twice a week, and when the vault is full use this as a fertilizer. There will not be a particle of odor, and except a few streaks through the soil one could not tell it from the ordinary soil. I have had section men dig down over a privy vault three months or more after it was abandoned and we could not tell it from ordinary soil. This, however, was exposed to heavy rains. If this soil is used as fertilizer it should not be used in gardens for one year at least.

The care of the excreta of fifty men at our shops and small terminals

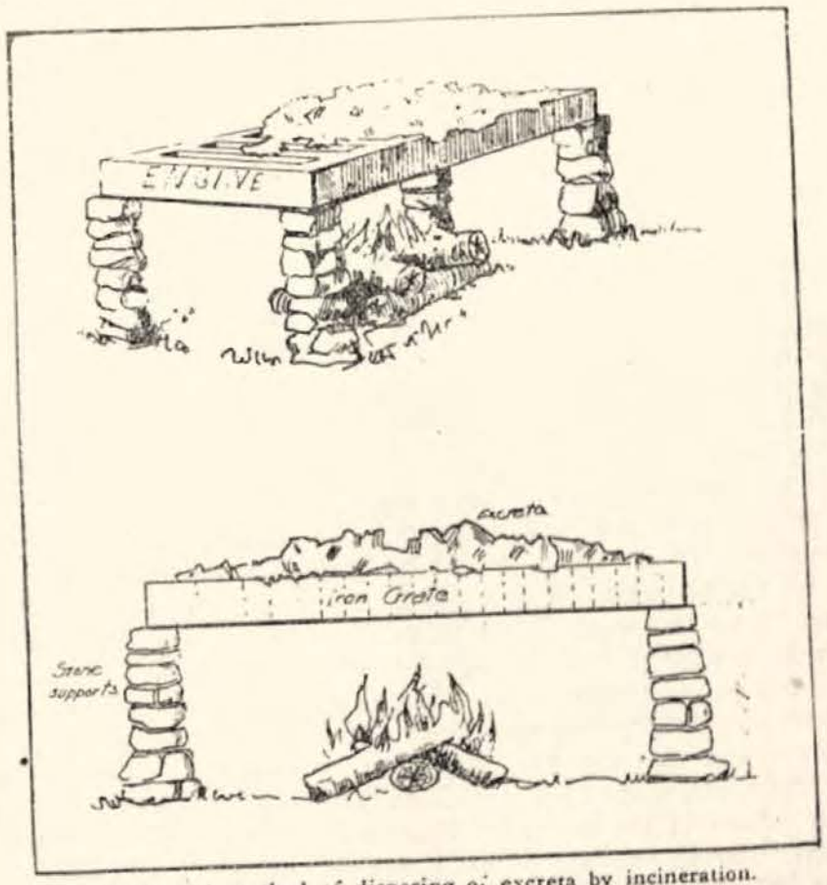


Fig. 3.—A method of disposing of excreta by incineration.

where there is no sewerage is another matter, however, and I am using an incinerator, and in some places where there is a pump engine boiler the excreta can easily be burned in this. If not, then a castaway engine

grate can be used by having it raised twelve inches from the ground, building a hot fire under it, throwing kindling wet with kerosene on this grate and adding the excreta and some tar to keep down odor. It is surprising how effectually tar will keep down odor. I have also used creosoted pile heads, which keep down odor very well. This is a method which all railroads can easily use and should use as a safe measure. There are always a lot of odds and ends to be burned at all shops and these could be used at this time.

We have a great amount of trouble at our stations by having our toilets abused by people who are not patrons of the railroad. If state boards and the public health service could insist that all municipalities have public toilets as they should, railroads would not have so much trouble with theirs. We often get notice from a health officer that we must install a privy at a certain place when it is used almost exclusively by citizens of the town who never patronize the road. Why should not these public officials get after municipalities which have such an army of worthless people to provide toilets for them? Other countries have them, and state boards should insist that all large municipalities have public toilets.

THE SHOPS.

When the railroad shops are built in a swamp, as they usually are, proper drainage should be provided and drinking water looked for at once. This drinking water should not be taken from the tank, as I have frequently found, until the source of such water is ascertained. There should be ventilators over the forges in the blacksmith shop and the master mechanic's office should be so located that smoke and gas from the engines would not come near it. Indeed, all general offices should be so located that gas and smoke would not be offensive. I have firm convictions on this point. It would seem more accurate and perhaps wiser, to deal with the human being as if he were a machine, with his efficiency as measured by his output, and endeavor to find what the conditions are which lower his efficiency. Sir Thomas Oliver in his masterly address on "Dust and Fumes, Foes of Industrial Life," pointed out the human and economic aspect of the work in which we are engaged. Indeed, it is estimated that nearly 70,000 wage-earners perish every year from industrial tuberculosis and that by factory inspection and effective methods for the prevention and removal of dust and gas fully one-half of these lives could be saved. This is not speculative, and abundant evidence can be produced that gas and smoke and fumes of gas are detrimental to the public health as well as lowering to the efficiency—either impairing it temporarily or tending to impair it permanently. I can also testify to the fact that this gas from engines prevents the proper ventilation of offices, and since such statements are true I urge all railroads to have their offices in the country. Our company has 50 acres 15 miles from Central Station and why would it not be wise to build offices at this place with outside porches, swimming pool, abundant shower baths and a large park for general games at the noon hour? Not a man reading these lines but will say that such a step would increase the efficiency of the working force and be a credit to the management.

Noise would also be avoided; indeed, the blowing of whistles and constant ringing of bells when the train is standing still is a nuisance and is prohibited by many municipalities. M. Emile Gautier declares Paris is becoming uninhabitable because of noise. Every pulsation and noise, he explains, causes nervous shock, comparable to a blow with a hammer, and is felt throughout the entire cerebral mass. These shocks are liable to cause or to create serious trouble. Experts who have studied the noises of Paris and their effects on the nerves and brain matter are convinced that the modern malady of neurasthenia is directly attributable to the riot of sounds by which we are daily assailed. No other explanation is needed for the growing number of nervous disorders. The pledge given Mrs. Rice by a little child in her campaign against unnecessary noise is wise and should be practiced by all trainmen—"I promise not to play near or around a hospital, when I do pass I will keep my mouth shut tight, because there are many invalids there, nor will I make myself a perfect nuisance."

ABSTRACT OF DISCUSSION.

Dr. A. M. Harvey, Chicago: Certain corporations have had medical health departments for over a quarter of a century, and the appointment of such an officer is becoming quite universal among the large corporations. About a month ago in an investigation among the larger industries of the United States, I received something like thirty replies to my inquiry which covered several questions: "Do you maintain a health department?" "Do you examine men physically?" "If you do maintain a health department, is it in control of a physician, and what voice does he have in the management?" Of the replies received from corporations that were fairly representative of the industries in our country, and probably employed several hundreds of thousands of men, about 70 per cent of the answers showed that they examined, physically, all applicants for work before employing them. That simply indicates the interest that corporations as employers of labor are taking in the health problem. The importance of medical supervision of health in industry is also emphasized by recent legislation in several states whereby it is made mandatory in certain trades and occupations, and by sanitary regulations imposed on employers in general. Among the advantages claimed for corporate or private medical health departments are: 1. Safeguarding the health of employes from the dangers of those seeking employment who may be afflicted with dangerous or infectious diseases. 2. The assurance of a fairly good working force from the beginning, by the physical examination of applicants. 3. Affording employes opportunity for early consultation, before an ailment has become established, thereby giving them the best chance for a cure. Employes are prohibited from returning to work before convalescence is well advanced, thus insuring a permanent cure. Employes in hazardous positions by reason of physical infirmities are placed in positions of security. Loss of time on account of sickness is lessened. Sanitary conditions of shops and offices, and favorable working conditions and environments are insured by personal inspection by sanitary experts. Prevention of disease, like the prevention of accidents, in-

sures a more efficient working force. The health department in a corporation increases the efficiency and earning power of the men. Judged by the great amount of money that has been expended in this direction by several large corporations, notably the Crane Company, the International Harvester, and the United States Steel and their subsidiary corporations, the health department pays; and the housing and living conditions have also been improved. A wonderful change can be brought about by a health officer who has the confidence of the corporations; but much yet must be done. The great work at present is to improve the living and housing conditions of the employes.

DR. J. W. KERR, Washington, D. C.: Dr. Campbell mentions a number of problems that are of interest to the traveling public. The term "car sanitation" is somewhat indefinite. It must, of necessity, include more than the sanitation of the cars, just as industrial hygiene must include more than sanitation of shops; for instance, the economic and sanitary conditions in the homes of laborers. It is important for us to approach these problems without prejudice. From the point of view of comfort and convenience, generally, the railroads of our country are in advance of the people who travel on them. I had occasion, recently, to compare the sanitation of our cars with those of foreign countries. A standing order in the Treasury Department requires any medical officer of the Public Health Service who travels under official orders, as soon as he returns to his station, to submit a report on the sanitary condition of the trains occupied. This report is immediately forwarded to the Secretary of the Treasury, and is then returned to the Bureau, and any criticism contained in the report is brought to the attention of the railroad company, if it is severe enough to warrant such action. Under this order I made an inspection of a train on the Baltimore and Ohio Railroad, coming from Washington to New York. Like inspections were made in Europe of trains operated over state and privately owned railroads. On the American train there were no common towels, and liquid soap was furnished in every car. The toilets were clean, and locked up while crossing waterways. In other respects this train was in good sanitary condition, and the railroad stations at both terminals were also in good condition. Many of the trains occupied on the continent, on the other hand, with the exception of the train from Cherbourg to Paris, were abominable; and some of them were state-owned, state-operated roads. This experience is cited as evidence that the railroad companies of America are trying to meet reasonable requests of the traveling public, and they are approaching these problems from a practical point of view. I think they want to improve conditions. One of the subjects needing careful study is the influence on health of gases in tunnels. Within the year a number of samples of gases have been collected by the Public Health Service from tunnels used by coal-burning engines, and electrically operated engines, respectively. The results of the analyses have been tabulated and are now in press. Studies are also being continued, of the extent of the migration of tuberculous persons in interstate traffic. There are about five or six areas to which tuberculous persons from all sections of the country travel for changes of climate. We know nothing, however, of

the volume of this travel; and we know very little of its effect on the public health. The regulation of it is difficult; and for that reason probably has not been as fully studied as it ought to be.

DR. JOHN W. S. MCCULLOUGH, Toronto, Ont.: Railway sanitation is a serious problem in our country because railway construction is active there. Dr. Campbell referred, however, to other carriers; and that allows me to speak of the pollution of the waters of the Great Lakes separating Canada from the United States. Last year, at the instance of the international joint commission, our board of health, in conjunction with the United States Public Health Service and some state boards of health bordering on these waters, made an extensive examination of the waters of the Great Lakes and connecting rivers. This investigation, which lasted from April to November and is perhaps the largest undertaking of a similar character ever completed by any of the countries of the world, demonstrated that while the lakes themselves are practically pure, the connecting rivers and portions of these lakes are dangerous to those who travel on them. When the enormous commercial and passenger traffic on the Great Lakes is recollected and also that the incidence of typhoid fever in the towns on the Great Lakes is the largest found in any part of these countries the dangers to the traveling public on these lakes is of deep concern. It was demonstrated that the St. Mary's River, St. Clair, Detroit, Niagara and St. Lawrence rivers were badly polluted; in fact, there are portions of the Detroit River which are so polluted as to be unfit for use after the most careful purification. None of the water of the St. Clair, St. Mary's, Niagara or Detroit rivers is fit for use without purification. From the mouth of the Niagara River the pollution is carried out into Lake Ontario for a distance of from 10 to 16 miles. Lake Ontario, in the line of boat traffic from Niagara to Toronto, is only 30 miles wide, hence this pollution travels across the international boundary; and in the line of this large traffic it is impossible to secure a pure supply of water for these boats without taking it from some source other than from the lake itself. I hope all will study this report and the significance of this boat pollution of the international waters on our traveling public. We have required a great many Canadian steamboats to take their water-supply from the middle of the lake in large tanks, and also to treat it by means of calcium hypochlorite.

DR. G. H. SUMNER, Des Moines, Iowa: Dr. Campbell has given us some excellent plans for the railroads to follow; but, on the other hand, it seems to me that state boards can give the public some instruction relative to the way that they should travel. Education is nothing more nor less than a bundle of habits; and Dr. Hurty has well said that you cannot hope to redeem the adult, but you may train the child. Therefore, it seems to me that we should issue short tracts of instruction to the public relative to their habits in travel. I rode on a Chicago Great Western train not long ago. The car was filled with people and the ventilation was poor. In one portion of the car was a woman and several children. I will not attempt to describe the condition of those children. but the odors in that car were extremely unbearable. Two train officials complained to concerning the bad air conditions, failed to perceive

any need for increased ventilation. When I reached Des Moines I reported the occurrence to the railroad commissioners and received a courteous letter from them. I believe, with Dr. Hurty, we had better begin again to teach the younger generation how to keep clean, and then to help the railroad companies in their efforts to better the conditions of travel.

DR. W. H. SANDERS, Montgomery, Ala.: Dr. Campbell is undoubtedly doing a great work in his field; and I am glad to say that the corporations very generally are upholding work of this kind. One of the largest corporations in the country, with its headquarters in my state (Alabama), has within the last two years organized quite as systematic a medical force for the purpose of looking after the health conditions prevailing among their employes as may be found in any of our states; and from visits to the grounds occupied by this corporation I see very great improvement. This work will spread among the corporations all over the country. Dr. Campbell's paper should be sent to all of the large corporations in the country. I want to emphasize that the people need educating on sanitary lines as much as the managers of corporations. In formulating rules applying to railroad sanitation in my state I have made them applicable to the traveling public quite as much as to the employes. If people traveling on trains are ignorant of what is reasonably deecnt and clean, they ought to be required to learn.

DR. CHARLES C. BROWNING, Los Angeles, Cal.: Some work has just been completed by Surgeon Carrington of the U. S. Public Health Service in California south of San Francisco and in Arizona, concerning the influence of the movement of tuberculous patients on themselves and the traveling public. A great deal said with regard to the danger from the tuberculous patients doubtless is true; much is founded on sentiment and not on scientific data. Surgeon Carrington has spent several years in the Southwest and has been doing very thorough work in our particular section. I presume that the report will be available through the Department of Public Health.

Dr. W. C. RUCKER, Washington, D. C.: The question of railway sanitation is a question of sanitation. When you have said that, you have said all. The sanitation of a vehicle is not different from the sanitation of a house. It is merely that of a house on wheels. The attempt to surround railway sanitation with something mysterious, something which stands by itself is wrong. The attempt to make the railroad companies and other transportation interests of this country the goat whenever it comes to anything sanitary is equally wrong. In enforcing the interstate quarantine regulations I have dealt with a large number of railroads; and there has never been an order, a suggestion or a comment made to those common carriers by the U. S. Public Health Service which has not been acted on favorably and immediately. The railway companies, as has been said, in their sanitary methods are in advance of the people living along the right of way. Furthermore, when they are asked to furnish an example to people living along the right of way, they are invariably willing so to do. I do not believe that much education is necessary with regard to the railway interests of this country.

I do agree that we should educate the general public how to travel on railroad trains; and, in order to do that, we must educate them how to live in houses. Not until people realize that cleanliness is our great bulwark against disease, whether it be in the home, the train or the ship, will they keep their environment clean. A speaker at the surgeon-general's conference the other day put the thing very aptly. He said that regulations had been made excluding from trains the common towel, that the common drinking cup had been abolished, and that it would not be very long until the common brush and comb were taken from the train. He said, after that the next thing will be to abolish from trains the common hog.

DR. CHARLES J. HASTINGS, Toronto, Ont.: I would emphasize the importance of better safeguarding in transportation by water. Dr. McCullough has already drawn attention to this in his reference to the work being done by the international joint commission. We have had an excellent demonstration in Toronto of the necessity for prompt action along these lines. In 1911 we found that a large percentage of our cases of typhoid in the summer months was traceable to the boats that cross our international waters. On investigation we found that the water used was all more or less contaminated with sewage. When the order was first issued to the company to abate this nuisance forthwith, they treated it with a certain amount of indifference. I then wrote them that their boats would be tied up at the docks on their return if they did not give ample evidence that their crew and passengers were to be properly and efficiently safeguarded; this resulted in prompt action on their part. They are only permitted to take water from the center of the lake; they have installed tanks of sufficient capacity to meet their requirements for the balance of their trips. Most of these boats have been so equipped as to meet these requirements and, consequently, this source of danger has been practically eliminated. Hundreds of thousands travel annually over the international waters extending from Duluth to the mouth of the St. Lawrence, into which, by our primitive methods, we are pouring millions of tons of sewage every day.

DR. M. P. RAVENEL, Columbia, Mo.: A very excellent paper by Dr. J. O. Cobb of the Public Health Service appeared in the journal of the American Medical Association several years ago calling attention to the fact that whether or not steamships on the Great Lakes took their water from the center of the lake, they got a certain amount of sewage into their water tanks, because the pipe through which the water is drawn opens out through the bottom of the ship, and when standing in port this pipe is filled with sewage. When the pumps are started to fill the tanks with water this sewage is first sucked up.

DR. A. E. CAMPBELL, Chicago: One word about education. The railroad I am connected with issues a magazine—fifteen or twenty thousand copies a month—and we have an article on sanitation in that magazine. I don't believe that water-coolers can be kept clean by cleaning them out every two weeks. They ought to be cleaned out at the end of every run. I have a good deal of trouble with dumps. Railroads have a lot of waste

material, and they throw it all into one place as filling material. This causes all kinds of trouble, and I have concluded that they should not do that without taking extra care about it.

CONCLUSION.

In closing this rather lengthy article upon the topic, *general information for people of Iowa*, we can do nothing better than embody herein the *report of the Committee on Standards of Purity for Rivers and Waterways*. The report herewith follows:

REPORT OF COMMITTEE ON STANDARDS OF PURITY FOR RIVERS AND WATERWAYS.

To the President and Members of the National Association for Preventing the Pollution of Rivers and Waterways:

GENTLEMEN: At a meeting of the National Association for Preventing the Pollution of Rivers and Waterways, held at Baltimore, Md., on December 13, 1911, it was voted "that a committee of five members of the association be appointed by the president to act as a committee on standards of purity for rivers and waterways, with instructions to study the general subject in a broad way, and to make a tentative report at the next annual meeting of the association on the feasibility of establishing standards applicable to different conditions," and on December 21, 1911, the undersigned were duly appointed by the president, Mr. Calvin W. Hendrick, to serve as members of this committee. We at once entered into correspondence and on June 27, 1912, met in New York for a conference.

The various matters involved have been considered in detail, but the present preliminary report is confined to certain fundamental propositions, about which there appears to be litle difference of opinion among sanitary engineers. These propositions, with a few explanatory notes, are as follows:

Your committee finds—

(1) That because of the increasing population of the country, the increasing tendency toward concentration of population in cities, the extension of agriculture, the increasing necessity of artificial fertilization, and the growth of manufacturing, it is and always will be physically impossible to maintain our rivers and waterways in their original and natural condition of purity. However much we may strive to the contrary, some pollution of the water is inevitable. A reasonable degree of cleanliness should nevertheless be demanded.

(2) That up to certain limiting points the use of our rivers and waterways as vehicles for the reception, transmission, and ultimate disposal of sewage and other liquid wastes is primarily an economic question. The discharge of raw sewage into our streams and harbors should not be universally prohibited by law.

(3) That the method of disposal of sewage by dilution is recognized as sound in principle and safe in practice, if carried on with proper restrictions. The power of streams to transport suspended matter, and the ability of natural bodies of water to oxidize and destroy offensive substances through the action of various physical, chemical, and biological processes, represent a natural resource that should be utilized as far as this can be done with safety and economy and without offense.

NOTE.—This is in line with the present idea of conservation. It is believed that the use of these forces of nature may be just as valuable in their way as the use of certain streams for water power is valuable in its way. Not to take advantage of them where possible would be contrary to public economy. Some streams probably serve their best use to the general public as carriers and destroyers of waste organic matter. The point to be determined is as to how far these forces can be utilized without offense. The ordinary limits of dilution based on the ratio of the population or the volume of the sewage to the stream flow are not sufficient, as they fail to take into account the velocity of the current and the opportunities for aeration. Further data on this point are needed.

(4) That for each river and waterway at any given point there is a limit to the amount of permissible discharge of waste matter. The reasons for this are not the same in all cases, but vary according to the use that is made of the river or of the water of the river, and according to the character of the territory through which it flows. No universal standard of purity can be wisely established or maintained.

(5) That when the extent of the pollution is such as to affect the public health in any way by any reasonable use of the river or of the water of the river, the sanitary aspect of the situation should control and the degree of pollution should be regulated accordingly.

NOTE.—This proposition involves the question as to what is a reasonable use of the rivers and waterways, which is a matter to be determined for each particular case, and one that in the event of conflicts between different interests must at present be decided by the courts.

(6) That when the extent of the pollution is such as to cause sensible offense to public decency in the course of any reasonable use of the river, this aspect of the situation may properly control.

(7) That when the extent of pollution is such as to cause material injury to fish or shellfish industries, or to the ice industry, this element may control.

(8) That when the extent of the pollution is such as to cause the silting up of the channels of navigable streams, this element may control.

(9) That even when the demands of public health, offense to decency, and interference with navigation are such as to place a limit to the pollution of the stream, the economic aspects of the case should be considered in regulating the amount of permissible discharge of waste matter—the fundamental principle being that the results accomplished shall be reasonably commensurate with the cost of prevention of the pollution.

NOTE.—It is recognized that there are great demands upon cities for expenditures made in the interest of public health and comfort, and that the relative results obtained by expenditures for different purposes should be considered when budgets are being made up.

(10) That while no universal standard of purity applicable to all rivers and waterways can be established, it is believed to be feasible to establish and maintain appropriate standards of a general nature for waters that fall within certain particular groupings. Your committee has this matter under advisement, but is not prepared to report upon it in detail at this time.

(11) That, inasmuch as the safety of public water supplies is the most important element in the problem of stream pollution at the present time, the following general principles should govern the discharge of sewage and waste matters into rivers and waterways.

(a) Streams from which water supplies are taken without purification should not receive any fecal matter, sewage, sewage effluent, or wastes that will render the water a menace to health or otherwise impair its natural quality.

(b) Streams from which water supplies are taken and used after purification should not receive fecal matter, sewage, sewage effluent, or waste matters in such quantities that the contamination of the water at any waterworks intake would put an unreasonable burden upon the purification works, or in quantities sufficient to produce the conditions referred to in the next paragraph. The treatment of sewage or wastes required to produce this result may vary from none at all, in the case of large streams where the pollution is very remote, to a thorough treatment if the pollution is large and near the waterworks intake.

(c) Streams not used for water supply may receive sewage wherever and in such quantities that its entrance will not sensibly offend decency in the reasonable public use of the stream or cause interference with navigation or with valuable fish industries or the ice industry. Where this can be done the sewage or wastes should receive such treatment before discharge as to bring the effluent within this rule, due regard being given to the relative cost of the processes required and the benefits to be derived.

(d) Large lakes from which water is used for a public water supply without filtration should not receive any fecal matter, sewage, or sewage effluent within a distance of several miles from the intake, depending upon local conditions as to currents, and suitable provision should be made for disinfecting the water supply.

(e) Large lakes from which water is used for public water supply after filtration should not receive fecal matter, sewage, sewage effluents, or other waste matters in such amounts or at such places that the water reaching the intake would be contaminated to the extent that an unreasonable load would be placed upon the filter, or in quantities sufficient to produce the conditions referred to in the next paragraph. The sewage treatment required to produce this reslult may vary in efficiency acording to the distance between the sewer outlet and the water-supply intake, the nature of the currents, and other local factors.

(f) Lakes not used for water supply may receive sewage if discharged in such a manner as to be quickly and thoroughly diluted, so that its entrance will not sensibly offend decency in the reasonable use of the lake, or interfere with navigation or with valuable fish industries. Where this can not be done the sewage should receive such treatment before discharge as to bring the effluent within this rule, due regard being given to the relative cost of the processes required and the benefits to be derived.

(g) Harbors and tidal estuaries may receive sewage at such places and in such amounts that the discharge does not sensibly offend decency in the reasonable public use of the water or cause interference with navigation or with valuable fish or shellfish industries. Where this can not be done the sewage should receive such treatment before discharge as to bring the effluent within this rule, due regard being given to the relative cost of the processes required and the benefits to be derived.

NOTE.—The tenth proposition brings up the very important question as to what is a reasonable burden to place upon a water-filtration plant. The data for deciding this have not yet been secured. It is recognized that water-filtration plants are not infallible and for this reason the work that they are called upon to do must not be too great. Until this fundamental question is settled, it will not be possible to formulate reasonable standards for purity for streams necessarily used both for sewage disposal and for water supply. It is not out of place to here remark that often greater economy can be secured by abandoning water supplies from polluted streams than by attempting to reduce the pollution to the required extent. The difficulty in doing this lies in properly adjusting the cost between the conflicting interests and raises some interesting questions of the policy of control that might be properly taken up for discussion by another committee of this association.

(12) Thus while recognizing that the pollution of many rivers and waterways is inevitable, and that absolute prevention of pollution is impossible, it is deemed imperatively necessary that some control over the discharge of waste matter into rivers and waterways be maintained in order that conditions prejudicial to the public health and comfort and damage to property may be kept at a minimum. The committee heartily indorses, therefore, the movement that is being made to keep the pollution of streams within reasonable bounds and not allow our rivers and waterways to become unduly soiled.

Your committee recommends the adoption by the association of these fundamental propositions, believing that they will serve as a basis for the establishment of more detailed standards later, and will be helpful to those who at the present time are engaged in formulating policies in regard to this matter.

Your committee also requests that it be allowed to continue its work for another year, and that it be given power to confer with the committee on river cleaning recently chosen by the section of sanitary engineering of the American Public Health Association, and, if thought desirable, to collaborate with this committee in the formulation of a joint report.

GEORGE C. WHIPPLE.
A. J. MCLAUGHLIN.
EDWARD BARTOW.
GEORGE M. WISNER.
H. W. CLARK.

New York, October 22, 1912.

THE OFFICES OF THE STATE BOARD OF HEALTH.

The Iowa State Board of Health offices are situated in the two rooms in the northeast corner of the Capitol Building. If the people of Iowa could see the small amount of space occupied by the State Board of Health in the Capitol Building, they would

Administrative Building, State Board of Health, Jacksonville, Fla.

wonder how we manage to accomplish the amount of work that is thrown upon us by the laws of the state. It is not necessary to go into detail here to enumerate the ten departments that are occupying the two rooms in the Capitol Building. We are so crowded for space that there are times when we hardly know which way to turn, for we have to move things around on the floor from one place to another in order to perform our work. This makes it very inconvenient and laborious, while it hinders us from performing our work in a profitable manner.

Through the courtesy of Dr. Joseph Y. Porter, secretary and state health officer for the state of Florida, we are permitted to print pictures of the administrative building of the State Board of Health, Jacksonville, Florida.

It was the pleasure of the secretary of the Iowa State Board of Health to visit this most beautiful building at Jacksonville, Florida, and to observe the work which was being done in the various departments connected with the State Board of Health of Florida. It was a real pleasure to go over this most convenient public health building and observe the work of the State Board of Health of Florida as it was being carried on in its various departments. We need not comment upon the usefulness of such a building in Iowa, but if the people of our state could but observe the work which we try to do to keep people from getting sick, we think that they would be willing to furnish us better quarters.

The picture of the building which we are printing herewith shows how well the state of Florida has taken care of its State Board of Health. We are glad that we are able to produce the picture of this most beautiful building which is the pride of the state of Florida. This building as the picture shows is located on a beautiful rise of ground, and the ground slopes away from the building in such a way as to make it have a condition which promotes the growth of flowers and a beautiful lawn, all of which make it appear as being a real health department.

This building is entirely of reinforced concrete, faced with buff pressed brick. The outside dimensions of the building are 83 feet 9 inches by 43 feet 2 inches, not including the front steps. The total height, from the basement floor to the attic floor is 34 feet 7 inches.

The following are the figures taken from Dr. Porter's report, which show the actual cost of the building:

COSTS.

Amount paid city of Jacksonville for site	$ 100.00
Advertising for bids	50.96
Architect's fees (purchase of plans)	600.00
Contract for construction	29,000.00
Piling and extra foundation work	1,193.00
Extra charges by contractors	292.01
Plumbing contract	2,688.95
Electric wiring contract	919.95
Electric fixtures	450.00
Steam heat contract	1,021.00
Superintendent of construction	500.00
17,358 cubic yards filling sand	3,851.50
Freight and drayage	6.45
Total cost	$40,673.82

OFFICES AND FURNISHINGS.

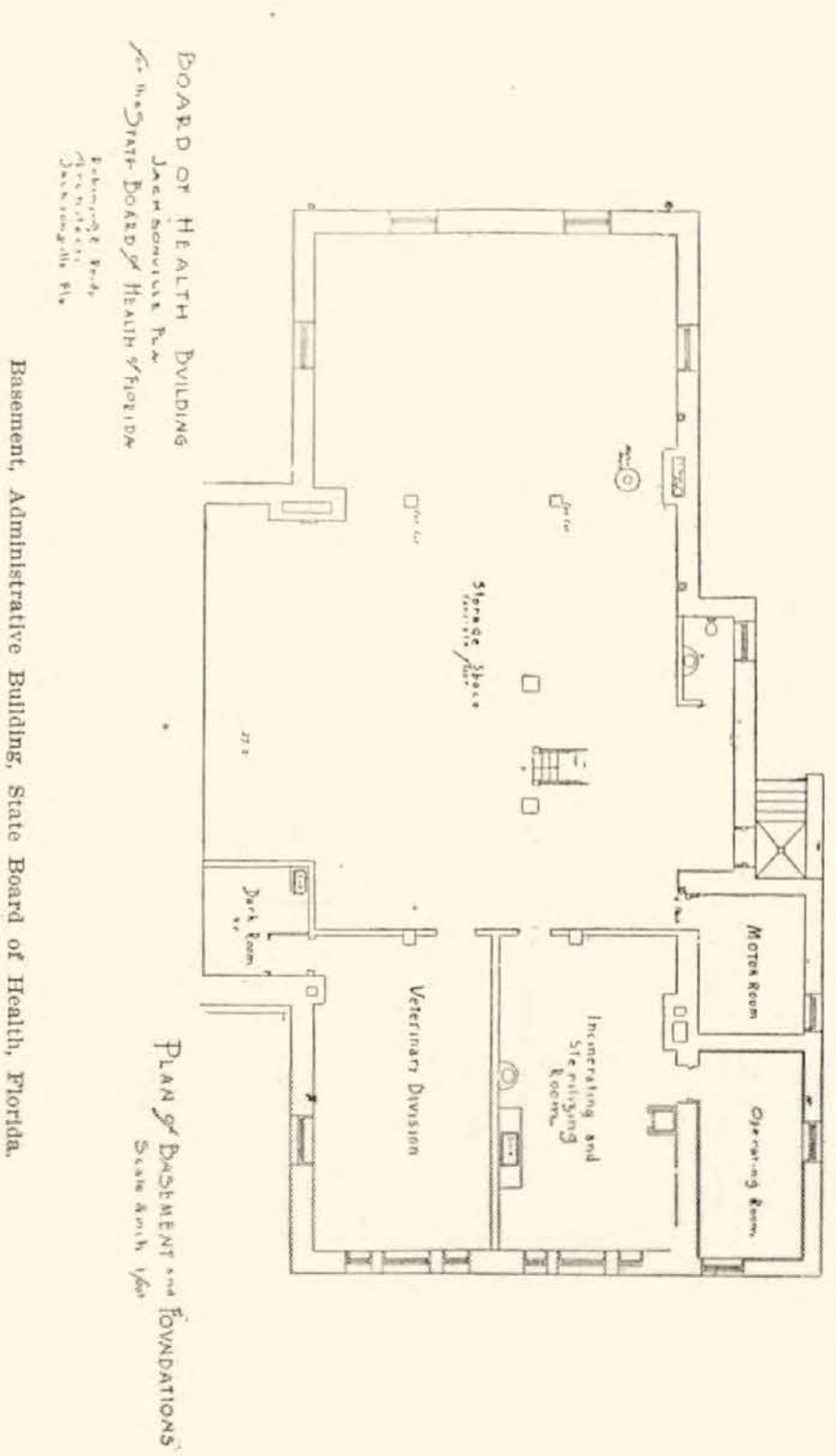
The purposes to which the various rooms are to be put are indicated on the drawings opposite this page, accompanying this article, and may be described as follows: The basement, in addition to having a large open space which can be used for storage purposes and in handling incoming and outgoing freight and express, has on the north a room for the veterinary division, an incinerating room, a sterilizing room, a dark room for micro-photographic work, and an operating room for use in connection with animal inoculation, and a room on the west for the motor which is to operate the refrigerating plant. The heating and hot water furnaces are also in the basement.

The first floor of the building has in its south end a public health exhibit room. The details of the exhibits have been worked out by the State Board of Health of Florida, and are very instructive and interesting. The office of the senior bacteriologist, the general laboratory room (at the north), a private laboratory, incubator and cold storage rooms, make up the balance of the first floor.

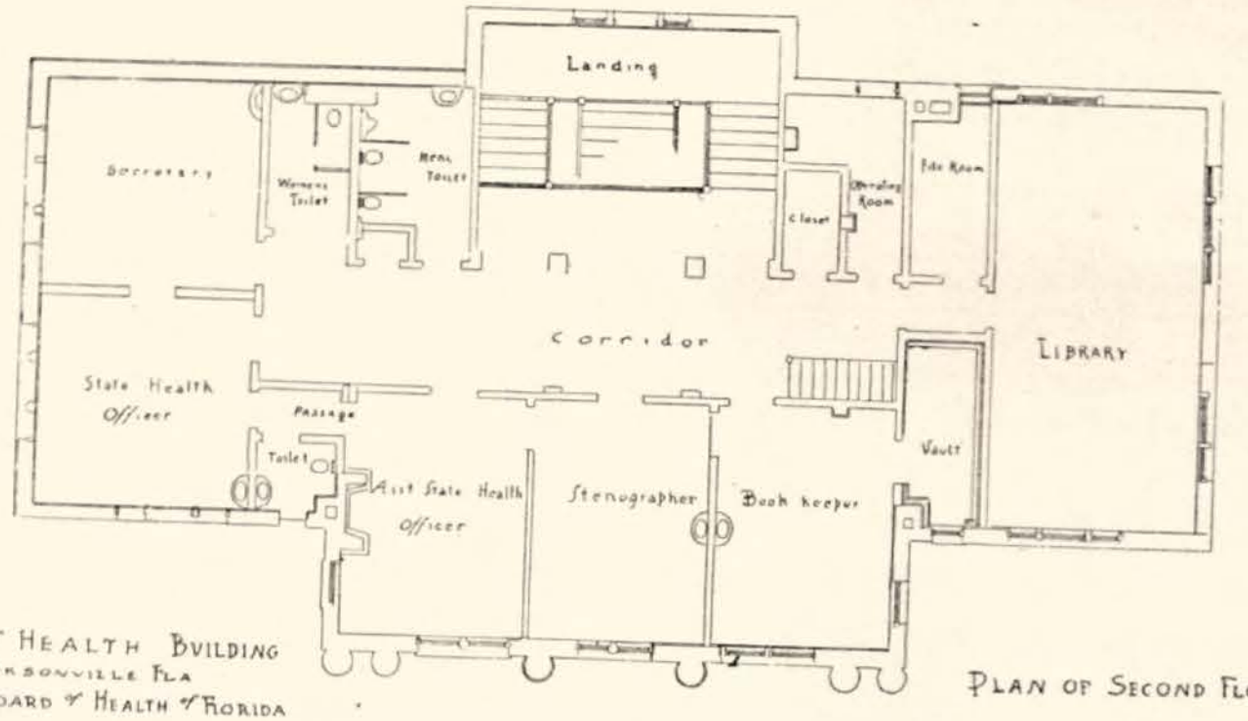
The second floor of the building is used for executive offices, quarters being provided for the State Health Officer (Secretary of the State Board of Health), his secretary, the Assistant State Health Officer, the stenographer and the bookkeeper. A large room at the north end of the building is for the State Board of Health library and assembly room. A vault, constructed of reinforced concrete, opens into the bookkeeper's office. An operating room for vaccinating against smallpox, typhoid fever and rabies, is also provided.

There is a large attic which can be finished and used for transferred files and vital statistics. This is quite an important item, for it is necessary to have a place to keep transferred files and vital statistics records.

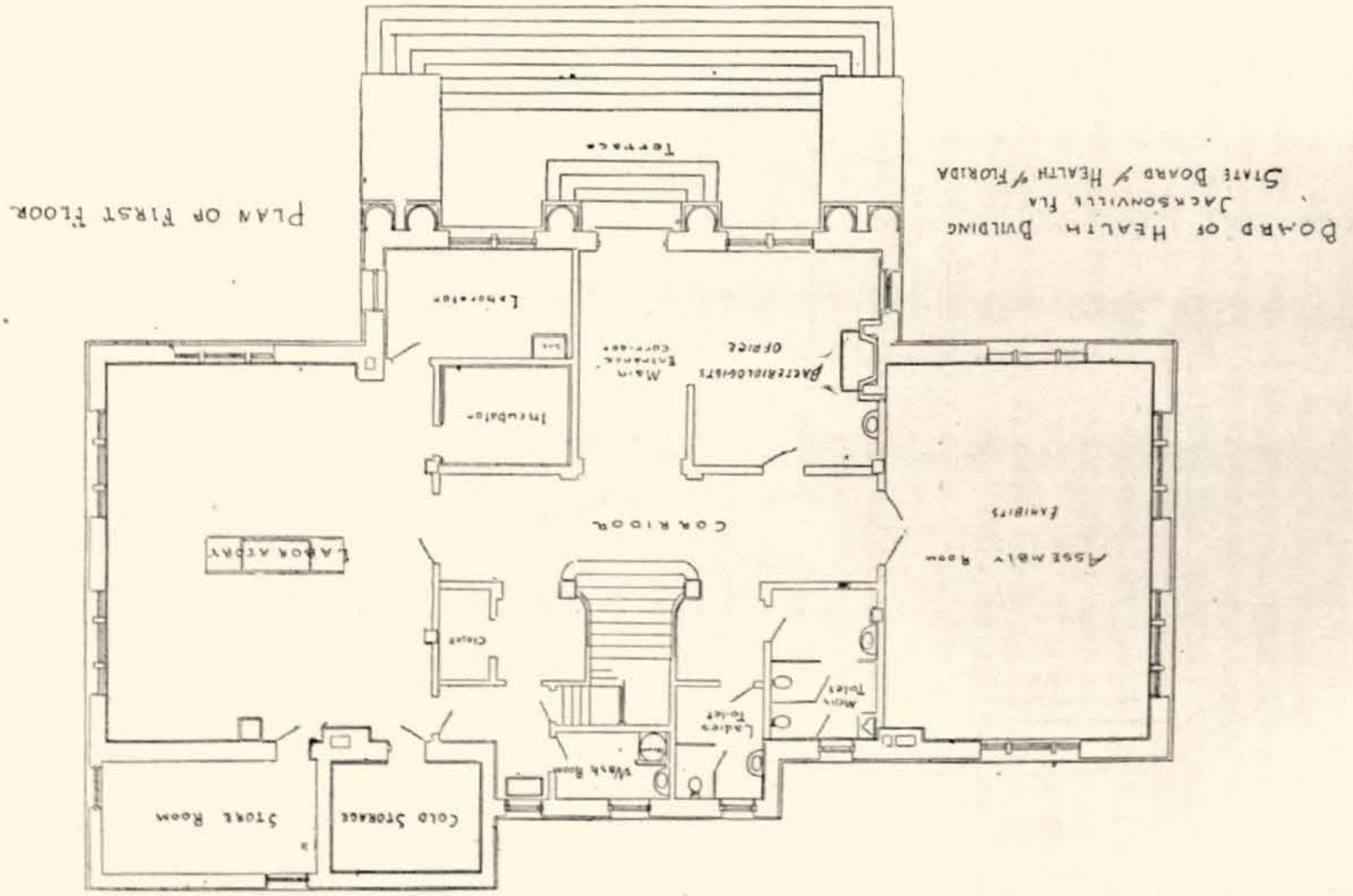
The offices of the State Health Officer, the Assistant State Health Officer, the library and the senior bacteriologist are each furnished with "Mission" style, early English finish, furniture, while the other offices are furnished with golden quartered oak. The fixtures in the veterinary division and in the general laboratory rooms are constructed of plain white oak, except that all shelves, backs and interior construction are of yellow pine, and the interiors of drawers of birch, with fumed oak finish. All file cases throughout the building are of steel.



Basement, Administrative Building, State Board of Health, Florida.



Second Floor, Administrative Building, State Board of Health, Florida.



First Floor, Administrative Building, State Board of Health, Florida.

Quarters of the State Board of Health Branch Laboratory in City Hall, Pensacola, Florida.

State Board of Health Building, Tampa, Florida.

Dr. Porter informed us that with this expansion in the quarters of the State Board of Health of Florida that there would be a corresponding increase in the work, for the intention is to extend the scientific research work of the Board to include an investigation and sanitary survey of the state with regard to water supplies, latent malarial carriers, special work on rabies, infantile diarrhea, latent gonorrhea, the common drinking cup, the bacterial flora of cities and towns in the state, and probably anti-venin work; also, a study of bovine uncinariasis and its relation to hookworm disease in the human; an extension of the distribution of public health literature, the establishing of a press bureau for the publication of public health articles and other useful work along the line of preventive medicine. Plans have been worked out for an "Animal House" which is located on the same site as the building, and provides a commodious and sanitary place for the various animals necessary in the bacteriological work of the Board.

A careful study of these plans will give the reader an exalted idea of the health work of the state of Florida, and Dr. Porter informs us that the legislature is always liberal in its appropriations for public health work and for the study of preventive methods in that state.

The state of Florida has two other well established laboratories beside the one located in the State Board of Health building at Jacksonville, Florida. One is located at Tampa and the other is located at Pensacola.

THE TAMPA LABORATORY.

A picture of the State Board of Health building, Tampa, Florida, is printed with the illustrations herewith. Dr. Porter, the State Health Officer for Florida, in 1909 and 1910, explained in his annual reports the reasons for the establishment of the Tampa laboratory:

> The work of the laboratory (at Jacksonville) has been constantly increasing and to such an extent that a demand came also from the southern section of the state for a branch laboratory to be located at Tampa, the appeal being made not only by medical bodies, but by commercial bodies as well and the civic government both of Tampa and of neighboring towns in that section. This request the board has seriously considered, and information having been obtained from the administrative government at Tallahassee that such a course would be legal, the same conditions that were initiated at Jacksonville were adopted at Tampa. The city council of Tampa then presented to the Board a very valuable lot at the corner of Florida avenue and Constant street, for this purpose.

Plans and specifications were at once prepared for a suitable building, and the contract for construction was awarded. The building was completed and accepted by the State Board of Health of Florida at a special session held at Tampa in August, 1910, and the laboratory removed from its temporary quarters to the new structure.

The building at Tampa, illustration printed herewith, was constructed at a total cost of $17,511.60. The laboratory proper is located on the second floor of the building, as well as the office of the bacteriologist in charge and the stenographer. Office space is also provided for the agent of the State Board of Health of Hillsboro county, and for the milk inspector of the city of Tampa.

THE PENSACOLA LABORATORY.

When the State Board of Health of Florida met in special session in February, 1910, the city of Pensacola presented a request that a laboratory be provided in that city to serve the western section of the state, and the State Board of Health authorized the State Health Officer to establish such an institution. As soon as practicable thereafter—during the month of June, 1910—the Pensacola laboratory was opened. The city of Pensacola kindly provided the Board with two large and commodious offices in the City Hall, where State Board of Health laboratory work could be done for the people residing in that part of the state.

It will thus be seen what provisions have been made by the state of Florida for laboratory and investigative work. The state of Iowa could do no better than to follow the example of the state of Florida. At the present time the Sanitary Engineer of the Iowa State Board of Health, Prof. Lafayette Higgins, feels the necessity of having a laboratory where he can work out experimentally some of the tests which he wishes to make along the lines of his investigative work, in order that he may give to cities and towns the necessary advice relative to the questions which are propounded to him.

The cramped quarters in which the State Board of Health is located, and no place where experimental work can be carried on, makes the work of the State Board of Health very limited in its scope. Iowa at the present time needs laboratories of the kind that have been established in the State of Florida, and these laboratories should be under the supervision of the State Board of Health as the Executive force in the State, in order that various analyses

may be made and reports given and published from time to time as cases shall demand. If the legislature could investigate the public health work which is being done by other States, then it would be easy to see how important it is that Iowa should be in the line of progress alnog these lines as well as are the southern states.

These illustrations and suggestions are not made with the purpose of criticising the legislative powers in the State, but to show what other states are doing and to ask that the people of Iowa shall be taken as good care of as are the people in other States. It is hoped that these illustrations will be examined and the descriptions herewith read with interest by the Members of the Legislature.

DIFFICULTIES HAVING TO DO WITH GENERAL CONDITIONS IN PUBLIC HEALTH WORK.

A. PUBLIC INDIFFERENCE.

Perhaps the greatest obstacle of all is the indifference—and perhaps the finding fault or criticism—not only of the general public, but even of health authorities, physicians, and many others who ought to help instead of hindering preventive medicine efforts. Preventive diseases have been present so commonly year after year that it has come to be considered as a regular, almost a natural, feature of the life of every community. Through vaccination smallpox has been so far prevented that few people, including physicians, have ever seen a case. If a case is discovered, the disease occasions consternation, and the community submits to rigid regulations to prevent its spread. How is it, however, with typhoid fever? The same community manifests comparatively little fear or uneasiness because of typhoid fever in its midst, even though, in individual years, the typhoid cases number a hundred for every case of smallpox.

B. EFFICIENCY OF LOCAL BOARDS.

While many local boards of health are carrying on active campaigns with excellent results, other local authorities, more numerous, are handicapped, partly because they do not appreciate the importance of public health work, and partly because they do not know how to proceed, even though they may have every desire to do so. To a considerable extent this is the outgrowth of the system under which they are appointed.

In Iowa every mayor and members of the city council, together with the health officer who must be a legally qualified physician,

constitute a local board of health. In the townships, outside the cities and towns, the township clerk and members of the board of township trustees, together with the health officer who must be a legally qualified physician, constitute a local board of health; hence, we have two classes of local boards of health, viz, local boards of health for incorporated cities and towns, and local boards of health for townships. Each local board of health must elect a legally qualified physician to act as health officer, and a local board of health is not properly organized until a health officer has been elected and qualified to act. Because of these different boards, and in consequence of lack of understanding, it happens not infrequently that the membership of the board changes entirely when there is a change in the local administration; the new mayor and councilmen and a new health officer, constitute a new local board of health; and the same is true as regards the township clerk and trustees and a new health officer. These new officers coming in this way may be entirely unfamiliar with health work; indeed, they may not even be interested in it. These new officials fail in many instances to even organize as a local board of health as Section 2568 of the Code provides. All local boards of health shall observe and follow this section of the Code.

These constant changes make it impossible for the State Board of Health to keep in touch with the same health officials of the state; and such a course of action does not tend to secure even and progressive administration of health laws. The changing of members and officers of health boards is not good practice. It would be better if the mayor and township clerk could be elected for an equal period of time, say for four years, and then elect one member of the city council and one member of the township trustees annually to serve for a period of three years, the city council and the board of township trustees making the election, selecting the best men for these places. This would do away with the changing of the local boards which is so detrimental to public health work. The best qualified physician should be selected for health officer and he should serve during the pleasure of the board or during good behavior.

By following some plan which avoids so many changes, much better health work would result. Even under the most favorable circumstances difficulties arise.

An interesting incident is related wherein a manufacturer had an outbreak of typhoid fever among his employees, and confined to

the manufacturing district, which happened to be in the thickly populated portion of the town. Following this outbreak, the manufacturing authorities established and carried out a most rigid sanitary code, with the result that there has been no case of typhoid fever in the manufacturing district of that town since.

It is stated that this manufacturing corporation and the health board became much interested in the sewage disposal of the town, and, with the idea of making typhoid outbreaks less likely in the future, advised the town to establish a sewer system for the thickly settled portion. The scattered farming portion of the population were greatly incensed, however, and at the following election chose a city council opposed to the establishing of a sewer system. Such work as this in public health administration is strongly calculated to discourage even a strong official.

It often occurs that there is a complete change all over the state every two years, thereby bringing entirely new men into office. These men, moveover, are more or less engrossed in the general affairs of the town, and oftentimes, desiring re-election, are slow to push health measures, even in the presence of an emergency, because such measures may involve inconveniences to voters whom they prefer not to antagonize. Even if they are interested and do try to accomplish somthing, they may be retired from office at the next election, and it then becomes necessary to begin all over again. Such a possibility of change interferes seriously with any permanent health administration policy, especially with any plan looking to joint action by adjoining or neighboring towns and municipalities.

C. INSUFFICIENT FUNDS.

Another obstacle to the carrying on properly of health work is the lack of sufficient funds. This lack grows out of the popular and official ignorance as to the value of health work already mentioned.

The idea has prevailed that the boards of health exist merely to supply the means for the paying of political or other debts; that their work (which is too often the case) amounted to nothing; that there was little or nothing of importance for them to do, and that, in consequence, there was no real need for funds. Appropriations and salaries are always small; indeed, in many localities there is no appropriation whatever for health work. Bills incurred for health purposes are paid from contingent or general funds

after the city council or other officials have passed upon the necessity for the expenditure. Under the circumstances the wonder is not that so little has been accomplished, but that so much good work has been done.

To secure better results there must be greater permanency in health departments. Interested and competent officials are needed, and when secured their tenure of office should continue during their efficiency. They should be paid adequately. The public should be taught that ample funds are necessary for the carrying on of health work, and that, although much less spectacular, there is much more virtue in *preventing illness* than in merely overseeing an epidemic after it has occurred.

D. SUMMER COLONIES.

There seems to be a growing demand in different parts of the state to establish summer places for residences. Within the last few years interest in country life and out-of-door recreation, especially during the warm season, has led to the establishment of numerous pleasure parks, summer colonies, and other places where out-of-door living may be enjoyed. The writer has observed many such places in Iowa. Within the state many such places have sprung up rapidly, and often dwellings are thickly crowded. The majority of these localities are without water supply other than the well, or means of sewage disposal other than the common privy. The writer has in mind at the present time, a summer park where many families move to spend the summer; but the common privy and the well are there also, and it is but a question of time, when it may be expected that an epidemic of typhoid fever will break out with its death-dealing power and the results no one can foretell.

In the absence of all sanitary regulation or supervision, the dangers from typhoid fever are great, there being many opportunities for the spread of the disease when once the infection is introduced. This criticism applies, also, to the many construction camps maintained in connection with steam and electric railway and power development during the past few years.

There is great need of supervision over these places in order to prevent the starting of diseases which may be carried all over the state and even transported to other states or brought from other states into our own. There is urgent need for state-wide sanitary regulation of such summer colonies and construction camps.

E. SANITATION OF PUBLIC BUILDINGS.

There should be a complete inspection of all public buildings, such as *police station houses, lock-ups, houses of detention, jails, houses of correction, prisons* and *reformatories.* Many of these places are disease producers and disease spreaders and all should be inspected and operated under specific sanitary rules. If the State Board of Health had the power it could adopt and enforce such rules as might seem necessary in the prevention and spread of communicable diseases. The following rules are suggested:

1. *As to Furnishing and Use of Drinking Cups.*—The use of the common drinking cup is insanitary, therefore, the provision of the common drinking cup should be made unlawful. A drinking cup after use by one person should be washed clean before being used by another.

2. *As to Dishes Used for Food.*—All dishes and utensils used for food should be thoroughly cleaned and washed in boiling water after use.

3. *As to Bedding.*—Every woman prisoner should be furnished with a mattress. The mattress should have a smooth surface and be covered with rubber or other waterproof material. This should be encased in a slip of washable material or covered with a sheet. These slips or sheets should be changed for each occupant and washed. Both mattresses and coverings should be removed from the cells during the day and thoroughly aired.

4. *As to Ventilation.*—All cells should be adequately ventilated. (Cells ventilated by means of openings into ventilating flues must have some means, mechanical or other, for creating a circulation of air.)

There could be no fewer requirements than those recommended above, and it is even thought that even more might be required with much benefit. The common roller towel, or a towel available for use by more than one person without being washed after such use, should be strictly forbidden in all public places of every kind.

The present State Board of Health is progressive and is trying with its meager appropriation to do all it can possibly do to advance the health interests of the great state of Iowa.

What is most needed is more money and more power to do things. Without these advances not very much more can be accomplished than what has been done and is now being done.

All of the foregoing pages have been written with a view to

give to all readers a complete comprehension of public health work. It should be understood, however, that the ground has not been covered. It would require several hundred pages to embody all that is to be said upon this most important subject. We, therefore, close with the hope that a few, at least, of our many readers will understand that the State Board of Health is trying to lessen *preventable sickness* and *untimely deaths.*

Most respectfully submitted,

GUILFORD H. SUMNER, M. D.,

Secretary-Executive Officer.

October 31, 1914.

GENERAL INFORMATION RELATING TO THE STATE BOARD OF HEALTH AND OTHER DEPARTMENTS LOCATED IN THE STATE BOARD OF HEALTH OFFICE.

It is difficult to explain to the people of the state the large and increasing volume of work incumbent upon the State Board of Health. Ten departments are domiciled in this office, as follows:

I. Board of Health.
II. Sanitary Engineering.
III. Hotel Inspection.
IV. Embalmers.
V. Nurses.
VI. Antitoxin.
VII. Bacteriological.
VIII. Medical Examiners.
IX. Optometry Examiners.
X. Vital Statistics.

Attention is called to the amount of work accomplished by the Department of Vital Statistics. Nearly two thousand death certificates are received by this department each month, over twenty thousand annually. These must be transcribed and copies sent to the clerk of court in each county, for record. Besides all this transcribing, records must be obtained from all counties, of all marriages, divorces and births.

The law requires this work to be done by the Secretary as Registrar, who receives no salary. In order that it may be properly accomplished, it is necessary that there be an assistant to the Registrar, as well as a competent clerk and stenographer.

APPROPRIATIONS FOR THE STATE BOARD OF HEALTH ANNUALLY.

DEPARTMENTS.

Board of Health:	
Appropriation	$ 5,000.00
Clerk hire	3,900.00
Bacteriological (State University, Iowa City)	6,000.00
Antitoxin	2,000.00
Vital Statistics:	
Appropriation	2,000.00
Clerk hire	900.00
Total	$19,800.00

FEES RECEIVED BY THE STATE BOARD OF HEALTH OFFICE FOR THE BIENNIAL PERIOD, BEGINNING JULY 1, 1912, AND ENDING JUNE 30, 1914, INCLUSIVE AND PAID INTO STATE TREASURY.

Board of Medical Examiners	$ 6,237.00
Embalmers	3,242.00
Nurses	2,447.00
Optometry	315.00
Vital Statistics	208.25
Total	$12,449.25

FEES TURNED INTO THE STATE GENERAL FUND, NOT USED BY THE BOARD.

(These amounts were saved by strict economy and turned back into the state treasury as unused funds.)

For the year beginning July 1, 1912, and ending June 30, 1913.

Board of Health	$ 612.09
Board of Medical Examiners	672.54
Board of Embalmers	493.51
Antitoxin Department	939.68
Total	$ 2,717.82

For the year beginning July 1, 1913, and ending June 30, 1914.

Board of Health	$ 627.92
Board of Medical Examiners	417.01
Board of Embalmers	143.50
Antitoxin Department	1,047.77
Vital Statistics	292.10
Total	$ 2,528.30

Totals saved for biennial period, beginning July 1, 1912, and ending June 30, 1914.

Total for first year of period	$ 2,717.82
Total for second year of period	2,528.30
Total for both years	$ 5,246.12

A SHORT HISTORY OF THE STATE BOARD OF HEALTH.

By Guilford H. Sumner, M. D., Secretary-Executive Officer, Des Moines.

The first knowledge which I have relative to the formation of the State Board of Health, I learned through Dr. W. S. Robertson, while I was a student in the Medical Department of the Iowa State University. Dr. W. S. Robertson was the first President of that Board, with whom I had any acquaintance. The next President with whom I had a familiar acquaintance was my preceptor, Dr. J. C. Shrader, then a professor in the Medical Department of the State University, as was Dr. Robertson. These two men were giants in their work as practitioners and as members of the State Board of Health.

I learned much of these men and their work by intimate association with them. Both were personal friends in my student life in the Medical Department of the State University, and both rendered me great assistance in my work when I began the practice of medicine. I mention these men more particularly because of my intimate association with them as a practitioner of medicine and a health officer.

I cannot enter into details by mentioning all of the different members connected with the State Board of Health, but I cannot pass the name of Dr. J. F. Kennedy, who for many years was the efficient Secretary. Dr. Kennedy was a scholar in every sense of the word, both as literary man and a medical practitioner. I enjoyed an intimate association with Dr. Kennedy during my early service as Health Officer of the city of Waterloo. In my visits to the State Board of Health office I always obtained excellent advice from Dr. Kennedy and he was always genial and pleasant to meet. Dr. Robertson, Dr. Shrader, and Dr. Kennedy were all good physicians and all served in the Union army and were good soldiers. I would gladly go into detail and mention all of the names of men connected with the Board in the past, but it would make this article too lengthy and would be only full of details without furnishing essential information.

My first knowledge of the formation of the State Board of Health leads me to begin with the year 1880. At that time the Board was organized, and the membership continued until the 35th General Assembly.

There were seven physicians, and a civil engineer, appointed by the Governor, one being appointed each year, for a term of seven years. The Attorney-General and the State Veterinarian were ex officio members of the Board. Among the physicians of the Board at that time there were four Regulars, two Homeopaths, and one Eclectic. For the purpose of proper representation, the State was divided into eight health districts.

Under this arrangement each district remained unrepresented for one year after its representative had served his seven year term, and thus it was that there were eight health districts and only seven physicians on the Board at any one time. It was intended that the same sectarian division of the Board members should be maintained, and accordingly each new appointee was selected from the same school of practice as the last retiring member.

The Secretary was elected by the Board but was not a member. The Secretary had no executive authority whatever and had no power to do anything under the law, except he was directed by the State Board of Health in session.

The annual appropriation for State Board of Health purposes has always been the same and is the same today. The annual appropriation for State Board of Health work was $5,000 and out of this was paid the salary of the Secretary, as it is today. All office and general expenses had to be paid with this appropriation. The Board members received only their actual expenses when attending meetings or serving the State in an official capacity. Of course the physician members of the State Board of Health constituted the State Board of Medical Examiners, for the purpose of conducting examinations for physicians who desired to come into Iowa to practice medicine. These physicians received, each of them, the sum of $8 per day and expenses for such work, and this plan existed up to the change of the law, which was made by the 35th General Assembly.

The functions of the Board were numerous and varied. The work was to exercise general supervision over the health matters of the state, to make regulations governing the management of dangerous diseases and to make suggestions relative to health regulations.

As medicine advanced and laboratory experiments were made, it became necessary in making diagnoses of certain diseases, such as diphtheria, and typhoid fever, that a public health laboratory be established, and this was done by the legislature which established a State Board of Health Laboratory in one of the University buildings, and the law made the Professor of Bacteriology and Pathology in the University the director of the same. Dr. Henry Albert, the efficient Professor of Bacteriology and Pathology of the College of Medicine at Iowa City, has held the position since its establishment. In this laboratory were made and are made at the present time bacteriological examinations for the diagnosis of diphtheria, typhoid fever, tuberculosis, hydrophobia and other diseases; patients who have been bitten by rabid animals are treated here by the Pasteur method, free of charge.

All examinations in the State Board of Health laboratory at Iowa City are made free to the physicians, cities and others of the State. We will not attempt to give the many thousands of examinations which have been made during the past years in this laboratory. The annual appropriation for the support is $6,000 a year, which is used to pay the expenses of the laboratory.

There is connected with the State Board of Health a Vital Statistics Department, of which the Secretary of the Board is the Registrar. For this service the Secretary receives no compensation. There are other departments connected with the State Board of Health, of which its Secretary is the Secretary of these departments, in the same manner as he is the Registrar of Vital Statistics. The departments are and have been for years, State Board of Medical Examiners, State Board of Embalmers Examiners, State Board of Nurses Examiners, and State Board of Optometry Examiners. All of these departments are separate and dis-

tinct from the State Board of Health and are not supported by any appropriations from the State. All of these last mentioned are supported by fees, and the law provides that no money shall be expended in excess of the fees received. This was and is a wise provision of the law, since there could be no other method, as provided by law, for paying expenses except the resources which were created by the collection of fees provided for by law. It will therefore be seen that if any money was expended beyond the fees collected, then such bills could not be paid, for the law provided no funds except the fees. These fees collected were all paid into the State treasury and all accounts were itemized, certified, and verified, and audited before payment could be made. All accounts of whatsoever character since I came into this office have been audited by the Executive Council, composed of the Governor, Secretary of State, Auditor of State, and Treasurer of State, and all fees were handled and are being handled in the same manner as appropriations made by the State legislature.

It is here to be observed by any one acquainted with the law that all appropriations and fees have been handled exactly alike, and at no time during my term as Secretary have I been allowed the expenditure of any money beyond the appropriations or the fees collected, and I mean by this that the members of the Executive Council were made acquainted at all times with the conditions existing in the State Board of Health office in order that there might be a wise expenditure of money. All bills being audited by the Executive Council, there is no opportunity afforded the State Board of Health office to use money in any other than a legitimate way.

All matters pertaining to the transportation and disposition of dead bodies are under the supervision of the Board of Health, and besides issuing certificates to physicians, as a Board of Medical Examiners, the Board of Health is charged with the examination and licensing of embalmers. The Secretary of the Board and two Board members together with two licensed embalmers comprise the Embalmers Examining Board, which Board conducts all examinations for embalmers and issues to them licenses.

The Secretary and one Board member, appointed by the Governor, together with three registered optometrists, serve as the Optometry Examining Board, which Board conduct all examinations relating to the fitting and adjusting of eye glasses.

The Secretary and two Board members, together with two registered nurses, comprise the Nurses Examining Board, for the registration of trained nurses. In addition the Board of Health establishes the standard of nurses' training schools and gives official recognition to such schools as meet the requirements. All nurses' certificates are issued by the State Board of Health, after examinations have been held.

The Board inspects all maternity homes in the State and grants permits to such as meet the requirements. The Board also maintains and keeps a supervision over these Maternity Homes, for the purpose of having them conducted in accordance with the Maternity Home law.

The Board makes rules and regulations regarding the inspection of

petroleum products and prescribes apparatus for testing and using these products. The oil inspectors, however, are appointed and removed by the Governor.

It must be observed that the Iowa State Board of Health covers a very wide and important field, and that a large part of its work is very technical and important. As has been said, the physicians of the Board of Health are charged with all medical examinations and it is the duty of the Board to control and regulate the practice of medicine in the State, to examine all applicants for license to practice, to revoke licenses for cause, and to establish a standard of medical schools.

Under the law the Board of Examiners is allowed to establish reciprocal relations with Boards of other States, and to license applicants to practice in Iowa without examination, provided they have been licensed in the State from which they come. This privilege may only be granted to applicants coming from states which recognize Iowa licenses in like manner. The establishing of reciprocity with other states is a matter of some difficulty and a great amount of detail, and depends upon the maintaining of the high standard of requirements of the Iowa Board.

Iowa physicians desiring to change their locations may enter the following states without submitting to an examination, in the following manner:

The Iowa State Board of Medical Examiners (Physicians of the State Board of Health) issues two forms of reciprocal certificates; *Reciprocity-A and Reciprocity-B.*

RECIPROCITY "A."

Upon the basis of a written examination in all the subjects required by this Board by a State Examining Board having reciprocal relations with the Iowa Board; provided, the applicant was a graduate of a medical college recognized by the Iowa State Board of Medical Examiners as in good standing upon the date of said graduation, and that the general average attained by the applicant at said examination was not below 75 per cent.

The Iowa Board places no limitations as to date of examination, but if the state issuing the certificate upon which reciprocity is asked limits reciprocal agreements to certificates issued upon the examination held subsequent to a special date, the same limitation shall be imposed upon its licentiates applying for recognition by the Iowa Board.

The following states have been admitted under both Reciprocity-A and

Colorado, Delaware, New Hampshire, New Jersey, Pennsylvania, Texas, Virginia, Wyoming.

RECIPROCITY "B."

Upon a certificate issued by another state holding reciprocal relations with Iowa upon the basis of a diploma without examination; provided, that the diploma was issued prior to January 1, 1899, by a medical college entitled to recognition by the Iowa State Board of Medical Examiners on the date said diploma was issued.

The following states have been admitted under both Reciprocity-A and Reciprocity-B:

Georgia, Kansas, Kentucky, Maine, Maryland, Wisconsin, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, Nevada, New Mexico, North Carolina, Ohio, Utah, West Virginia.

Graduates of Osteopathic Schools are examined by the Board of Medical Examiners in Anatomy, Physiology, Chemistry, Histology, Pathology, Gynecology and Obstetrics, at the same time, in the same manner, and upon the same questions, as graduates of medical colleges and are licensed by the Board upon attaining a general average of 75 per cent. or above.

A very important department of the State Board of Health is the Antitoxin Department, which has saved not only hundreds of lives, but has saved to the people of Iowa many thousands of dollars. The Board realizing that the high price of diphtheria antitoxin ($7.50 a dose) was preventing its use and thus favoring the spread of diphtheria, made arrangements with the Dr. H. M. Alexander & Co., of Marietta, Pa., to furnish antitoxin of the highest quality to the Board for $2.25 a dose. This is furnished through local distributors, appointed by the Board. There are 250 stations scattered all over Iowa, where State Board of Health Antitoxin can be procured at lowest rates. Remittances are made by the distributors to the H. M. Alexander & Co., and the Board is required to keep things in order and to maintain a central depot, and to supply emergency demand. The state needs only to provide an extra clerk to keep this plan in operation.

In order that the people of Iowa may know something of this one department, I desire to embody in this article the following statement of fact:

DIPHTHERIA.

Amount of money saved to the people of Iowa by the Iowa State Board of Health, through its antitoxin stations, which are 250 in number, and where Iowa State Board of Health antitoxin has been distributed during the past four years. This not only represents money saved, to the people of Iowa, but represents hundreds of lives saved from the destructive disease, *diphtheria*.

DIPHTHERIA ANTITOXIN.

Number of packages used in four years	8,258
Amount actually paid for same	$11,526.75
Cost if furnished at regular prices	$38,422.50
Amount saved to the people who used Iowa State Board of Health antitoxin	$26,895.75
Number of packages sent out on emergency orders from State Board of Health office	3,415
Amount paid for same	$ 4,555.35
Cost if furnished at regular price	$15,184.50
Amount saved to the people on antitoxin sent from State Board of Health office on emergency orders	$10,629.15

The antitoxin furnished by the Iowa State Board of Health was prepared under United States government license issued to the Dr. H. M. Alexander & Co., Marietta, Pa.

The above figures are taken directly from the books and show the amount actually saved to the people of Iowa.

It should be observed in this connection that the money saved to the people of Iowa by the Iowa State Board of Health has not only been a financial saving but hundreds of lives have been saved whose value and usefulness to our state and people cannot be measured with a money value.

One of the purposes of the State Board of Health as stated in the code, is to disseminate knowledge of hygiene and to suggest further necessary legislation. The Board has tried to render at all times efficient service, and has ever been ready and anxious to help the legislature to promote the health and happiness of the people.

We have thus outlined in a brief way some of the history and a part of the work which the State Board of Health has tried to do. We now come to the Thirty-fifth General Assembly, which enacted a new section of the Board of Health law. Section 2564 of the code supplement was repealed and Chapter 207, Acts of the Thirty-fifth General Assembly, was enacted in lieu thereof. This new law of the Thirty-fifth General Assembly obliterated the health district plan, and provided that the Governor, Secretary of State, Auditor of State, and Treasurer of State should all become ex-officio members of the State Board of Health, and all funds of whatsoever kind or character which had been made heretofore to the State Board of Health, or which shall be made hereafter were to be expended under the supervision and sanction of the executive council, and not under the supervision of the State Board of Health, as heretofore. This new law makes the Governor, the Secretary of State, and the Auditor of State an appointing board, and the secretary of the Executive Council is secretary thereof. This appointing board appoints five members of the boards, composed of a sanitary engineer and four physicians. Of the five members who are thus appointed not more than three of whom shall belong to the same political party, and of the four physicians not more than two of whom shall belong to the same school of practice. Of the five members composing the board, three are republicans and two are democrats. It will thus be seen that the State Board of Health is not only non-partisan, but is not predominated by any particular school of medicine, as the four physicians now connected with the State Board of Health as members are composed as follows: Two physicians belong to the regular school of practice; one is a homeopathic member and one is an eclectic member, thus all of the schools of medicine are represented as provided by law.

The employees and all connected with the office feel it their duty to work for the whole state and all of the people all of the time. There is not a political appointment connected with the office or its service in any manner whatever. All parties and all creeds and all colors are treated exactly alike when transacting business with the State Board of Health.

The new plan of organization we believe to be the most perfect of any with which we are acquainted, for the reason that when the Board of Health is not in session the Secretary, by law, is the State Health Com-

missioner and the executive officer of the board, and has full power to act in the same manner as the board would have when in session. This plan allows the Governor, Secretary of State, Auditor of State, Treasurer of State, the physicians of the board, and the Sanitary Engineer to all come together and outline public health work, then when the board adjourns, the Secretary becomes the executive officer of the board.

Another advantage is given in the new law over the old law that an efficient member may be re-appointed, which could not have been done under the old law. A member can also be appointed from any part of the State which may be thought best by the board of appointment. This very efficient law was prepared by the committees on public health and was introduced in the legislature as a committee bill. After it has been discussed thoroughly in both committees, the House of Representatives and the Senate, for a number of weeks, the bill was almost unanimously passed by the legislature.

Under this new law the Sanitary Engineer and the Secretary have been working together harmoniously to bring about better conditions in the State relative to a pure water supply and the proper disposal of sewage and night-soil, and during the last two legislatures bills have been introduced in the legislature asking for help in the matter of preventing the pollution of streams, and no city has been permitted, when putting in a new sewerage system, to pass its sewage into any stream without first making arrangements for purifying the sewage before being allowed to pass into the stream. A large number of the cities and towns of Iowa, many years ago, were permitted to empty their sewage into the streams, and these systems having been enlarged, more sewage has been emptied into our streams, and the State Board of Health not having the means at hand, neither had it the help to make a complete sanitary survey of the state; but a large number of cities and towns have been surveyed and recommendations have been made to these cities relative to the establishing of their water works systems and their sewerage systems. This has not been done so extensively as the board has desired, but progress has been made, and a complete supervision has been in operation under this new law. Conferences have been held in the State Board of Health office at which the Governor and members of the Executive Council were present, and the board feels that, during late years, there has been a steady progress all along the line of public health work in Iowa.

Under the board's direction, bulletins have been issued from time to time on all of the various topics which have related to all of the contagious and infectious diseases and the means of preventing their spread. The bulletins have treated specially such subjects as: Smallpox; The Unsuspected but Dangerously Tuberculous Cow; Typhoid Fever—What Causes the Disease and How It May Be Prevented; Save the Babies; Infant Mortality—Vital Statistics; Clean Bakeries and Restaurant Kitchens—Death Lurks in Dirty Food; Preventive Medicine—the Plague and Leper Rat; The Public Drinking Cup; The Diphtheria Carrier; What the Mayor and City Council Can Do in the Prevention of Typhoid Fever; A Method of Preventing Smallpox, Pellagra; The Septic Disposal of

Sewage and Night Soil; Conservation; Pneumonia; Tuberculosis; Rural Sanitation; Special Instructions Relating to Infantile Paralysis and Its Prevention; an Embalmers' Bulletin, with complete instructions relative to the proper disposal of the dead; Fumigation and Disinfection of Houses and Public Buildings, a complete guide for the use of Nurses and Hospitals.

The above are but a few of the very many topics that have been handled and literature sent out all over the state. Hundreds of extra copies have been distributed among the schools, and public health and hygiene have been taught.

The new board feels that its work is but just begun and its purpose is to improve and improve, and improve. At the present time the State Board of Health is hoping for a better and a purer water supply and is working to that end. The board has become thoroughly convinced that at the present time there is as much danger in a pollution of the soil by the use of the common privy as there is danger in the pollution of our streams.

It is to be seen with the present formation of the board as outlined by the last legislature that we are progressing along right lines, and it should be observed that the new board has only been in operation, at this writing, just seventeen months, and, of course the people of our state certainly do not expect us to accomplish everything in this short time. We hope that the coming legislature and the people of Iowa will give the State Board of Health a sufficient appropriation in order that more work and better work may be done. In concluding this brief outline I wish to state that we have only spoken of the old board under the district plan and the work of the new board under the general or state plan, and it is believed that the present plan will work out more and better results in public health work in Iowa than any other which has ever been promulgated heretofore. What we need now is a larger appropriation, in order that the board may expand and thereby be enabled to do more and better work.

With all funds which are appropriated for State Board of Health purposes in the hands of the Governor, Secretary of State, Auditor of State, and Treasurer of State, there can be no mistake made in any of the work, as the members of the Executive Council sit at the sessions of the State Board of Health and become thoroughly acquainted with the work of the board. The Governor of the State keeps a very close tab on the work of all the departments, and we feel glad to consult with him, as the chief head of the State Government, relative to all of the work which the State Board of Health has done in the past and is now doing.

REPORT OF QUARANTINABLE DISEASES FOR THE FISCAL YEAR ENDING JUNE 30, 1913.

	Scarlet fever	Diphtheria	Smallpox	Cerebrospinal meningitis	Anterior poliomyelitis	Total
1912						
July	21	24	21			66
August	17	28	11		8	64
September	24	66	7	3	28	128
October	47	213	22	4	24	310
November	52	305	35		10	402
December	77	99	44	1	2	223
1913						
January	111	118	235	10	2	476
February	134	97	294	6	1	532
March	141	74	416	6		637
April	122	109	336	8		575
May	96	61	229	3	1	390
June	30	36	134	3	4	213
Total	878	1,230	1,784	44	80	4,016

REPORT OF QUARANTINABLE DISEASES FOR THE FISCAL YEAR ENDING JUNE 30, 1914.

	Scarlet fever	Diphtheria	Smallpox	Cerebrospinal meningitis	Anterior poliomyelitis	Total
1913						
July	12	26	48	2	11	99
August	13	27	15	3	17	75
September	24	43	21		14	102
October	66	83	53	7	2	211
November	101	116	117	2	3	339
December	107	88	240		2	437
1914						
January	141	92	537	5	2	777
February	127	99	469	2		698
March	151	108	626	4		889
April	196	65	467	3	2	733
May	113	72	313		4	502
June	23	76	180			279
Total	1,074	891	3,086	24	57	5,132

TABLE NO. 1.

QUARANTINABLE DISEASES REPORTED TO THIS OFFICE FROM JULY 1, 1912, TO JANUARY 1, 1913, ARRANGED ACCORDING TO COUNTIES.

COUNTY	DISEASE	July	August	September	October	November	December	Total
Adair	Diphtheria				1			1
	Anterior poliomyelitis				1			1
Adams	(No report)							
Allamakee	Scarlet fever	1						1
Appanoose	Scarlet fever		1	1		4	8	14
	Diphtheria		3	1	9	12	1	26
Audubon	Scarlet fever						1	1
Benton	Diphtheria			1	15	386	2	204
Black Hawk	(No report)							
Boone	Scarlet fever		1					1
	Diphtheria				2	3	2	7
	Anterior poliomyelitis				1			1
Bremer	(No report)							
Buchanan	(No report)							
Buena Vista	Scarlet fever				2			2
	Diphtheria				3	3	2	8
	Smallpox				1			1
Butler	Smallpox					1		1
	Cerebrospinal meningitis				1			1
Calhoun	Anterior poliomyelitis				1			1
Carroll	(No report)							
Cass	Scarlet fever					6	1	6
Cedar	Anterior poliomyelitis					1		1
Cerro Gordo	Scarlet fever	1						1
Cherokee	Diphtheria				3			3
Chickasaw	Anterior poliomyelitis					1		1
Clarke	Diphtheria	1						1
	Smallpox						1	1
	Anterior poliomyelitis				1			1
Clay	Diphtheria	2	3				1	6
Clayton	Scarlet fever	1	2					3
Clinton	Scarlet fever						1	1
	Diphtheria				1	7	1	9
	Smallpox			1				1
	Anterior poliomyelitis				6	5		11
Crawford	Diphtheria		3		2			5
	Anterior poliomyelitis			1	2			3
Dallas	Scarlet fever	1					2	3
	Diphtheria						1	1
	Smallpox					3	9	10
Davis	Diphtheria					1	1	2
Decatur	Diphtheria				1			1
	Smallpox	1					3	4
	Anterior poliomyelitis				1			1
Delaware	Diphtheria					1		1
Des Moines	Diphtheria	1			9	3		13
Dickinson	Diphtheria				1	1		2
Dubuque	Diphtheria						1	1
	Smallpox						1	1
Emmet	Scarlet fever				2	1		3
	Smallpox						1	1
Fayette	Diphtheria	1						1
	Anterior poliomyelitis				1	1	1	3
Floyd	(No report)							
Franklin	Scarlet fever				1		1	2
	Diphtheria						2	2
Fremont	Scarlet fever						2	2
	Diphtheria						1	1
	Anterior poliomyelitis				1			1
Greene	Scarlet fever						2	2
	Diphtheria					1		1
Grundy	Diphtheria					1		1

TABLE NO. 1—Continued.

COUNTY	DISEASE	July	August	September	October	November	December	Total
Guthrie	Scarlet fever			12	6	4	3	24
	Diphtheria			2	2			4
Hamilton	Anterior poliomyelitis		1		1			2
	Diphtheria					1	1	2
Hancock	Anterior poliomyelitis			1	1	1		3
	Scarlet fever				1			1
	Diphtheria		1		2		1	4
Hardin	Smallpox	1					4	5
Harrison	Diphtheria						1	1
Henry	Smallpox			1				1
Howard	Scarlet fever	3						3
Humboldt	Diphtheria						2	2
Ida	Diphtheria					1		1
	Cerebrospinal meningitis					2		2
Iowa	Anterior poliomyelitis			1				1
Jackson	Scarlet fever		2	2	2			6
	Diphtheria						1	1
Jasper	Anterior poliomyelitis	1	1		3	2		7
	Scarlet fever					1		1
	Diphtheria				1			1
	Smallpox		2			8	2	12
Jefferson	Anterior poliomyelitis	1				1		2
Johnson	(No report)			1				1
	Scarlet fever							
Jones	Anterior poliomyelitis					1		1
Keokuk	Diphtheria			4	1			5
	Scarlet fever		1			1		2
Kossuth	Anterior poliomyelitis				1			1
	Scarlet fever		1	1				2
	Diphtheria		1					1
Lee	Smallpox			1		2	3	6
	Scarlet fever				1	2		3
	Diphtheria					2		2
Linn	Anterior poliomyelitis						2	2
	Scarlet fever				3	1		4
Louisa	Diphtheria	2	2			1	8	13
Lucas	Scarlet fever	1	2		3	4	7	17
	Scarlet fever			1				1
Lyon	Diphtheria				2			2
Madison	Scarlet fever				1			1
Mahaska	(No report)					2		2
	Scarlet fever							
	Diphtheria	1	1		2	5	1	10
Marion	Anterior poliomyelitis		4	2				6
	Scarlet fever			1	1			2
Marshall	Diphtheria				1			1
	Scarlet fever			4	5	1		10
	Diphtheria					2		2
Mills	Smallpox				13	1	2	16
Mitchell	Anterior poliomyelitis				5			5
Monona	Diphtheria			1	1			2
	Scarlet fever						1	1
	Smallpox						1	1
Monroe	Anterior poliomyelitis						1	1
	Scarlet fever				1			1
	Diphtheria	8	2			3	1	14
Montgomery	Cerebrospinal meningitis			2			1	3
Muscatine	(No report)				1			1
	Scarlet fever							
O'Brien	Diphtheria						13	13
Osceola	(No report)	2		1				3
Page	(No report)							
	Scarlet fever							
Palo Alto	Diphtheria		1					
	Scarlet fever						1	2
Plymouth	Diphtheria	1					1	1
	Diphtheria	5	1	1	1	1	1	1
Pocahontas	Smallpox	1	3	1	2			10
	Diphtheria	13						7
	Smallpox						3	13
				1		20	1	3
								22

TABLE NO. 1—Continued.

COUNTY	DISEASE	July	August	September	October	November	December	Total
Polk	Scarlet fever		3	2	10	12	12	39
	Diphtheria	2		29	88	49	36	204
	Smallpox	1	1	1	6	2	18	29
	Cerebrospinal meningitis			1	3			4
	Anterior poliomyelitis				1	1		2
Pottawattamie	Scarlet fever		1	1			3	5
	Diphtheria		3	4	24	11	5	47
	Smallpox		9	4	8		3	24
	Cerebrospinal meningitis						1	1
	Anterior poliomyelitis					1		1
Poweshiek	Scarlet fever		1					1
	Anterior poliomyelitis			2			1	3
Ringgold	Diphtheria						1	1
Sac	Smallpox					2		2
	Anterior poliomyelitis					1		1
Scott	Scarlet fever		1		3	4	3	11
	Diphtheria	3		2	3	4	4	16
	Smallpox	1				1		2
	Anterior poliomyelitis		1	2				3
Shelby	Scarlet fever			1	3		2	6
	Diphtheria			3				3
Sioux	Scarlet fever				1	3		4
	Diphtheria	1						1
Story	Diphtheria	1						1
	Anterior poliomyelitis					2		2
Tama	Diphtheria		1		3			4
Taylor	(No report)							
Union	(No report)							
Van Buren	Scarlet fever					1	2	3
Wapello	Scarlet fever			2	4		3	9
	Diphtheria						1	1
Warren	Scarlet fever					3	2	5
	Diphtheria				1	2	5	8
Washington	Scarlet fever				4	4		8
	Diphtheria					1		1
	Anterior poliomyelitis		2					2
Wayne	Scarlet fever	2						2
	Diphtheria	2			1	2	4	9
Webster	Scarlet fever	3			1	1	1	6
	Diphtheria					2	1	3
	Smallpox				1	6	2	9
	Anterior poliomyelitis				1			1
Winnebago	Diphtheria				14	1		15
Winneshiek	(No report)							
Woodbury	Scarlet fever				1			1
	Diphtheria			1			1	2
	Anterior poliomyelitis		1					1
Worth	(No report)							
Wright	Anterior poliomyelitis			1	1			2
Total		66	64	128	310	402	223	1,193

TABLE NO. 2.

QUARANTINABLE DISEASES REPORTED TO THIS OFFICE FROM JANUARY 1, 1913, TO JULY 1, 1913, ARRANGED ACCORDING TO COUNTIES.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Adair	Scarlet fever					6	2	8
	Diphtheria		1					1
	Smallpox	3	3			5	6	16
Adams	Anterior poliomyelitis	1						1
	Scarlet fever		1	2				3
Allamakee	Smallpox		5		1			6
	Scarlet fever			3	7			10
Appanoose	Smallpox			1				1
	Anterior poliomyelitis	1	1					2
Audubon	Scarlet fever	1		8	2	2		13
	Diphtheria			1			1	2
	Cerebrospinal meningitis		1					1
Benton	Scarlet fever			1			1	2
	Diphtheria			3			1	4
	Smallpox	2						2
Black Hawk	Scarlet fever				1			1
	Diphtheria			1	2	1		4
	Smallpox	4						4
Boone	Diphtheria	3		1			1	5
	Smallpox					2	1	3
Bremer	Scarlet fever			6	8	4	2	20
	Diphtheria	10	4	3			1	18
Buchanan	Smallpox	3	7	11	18	24	14	77
	Scarlet fever			1				1
Buena Vista	Diphtheria					1		1
	Smallpox				1			1
Butler	Scarlet fever					1		1
	Diphtheria		1		1			2
	Smallpox	2	1	1	1			5
Calhoun	Scarlet fever			4		3	3	7
	Smallpox		1	4				5
	Anterior poliomyelitis		1					1
Carroll	Scarlet fever						1	1
	Smallpox			2	8			10
Cass	Scarlet fever	3	2	2	1	1		9
	Diphtheria		6			1		7
	Smallpox	1		2	1			4
Cedar	Diphtheria		27				11	38
	Smallpox						1	1
Cerro Gordo	Scarlet fever		23	10	3	9		45
	Smallpox	1						1
Cherokee	Scarlet fever		2					2
	Smallpox	3	2	3	1			9
Chickasaw	Diphtheria	10	18	40	7	1		76
	Smallpox				3	3	1	7
Clarke	Scarlet fever				2			2
	Smallpox			2				2
Clay	Scarlet fever	1	1	1				3
	Smallpox		3					3
Clayton	Scarlet fever	1	6	29	4			39
	Diphtheria	3						3
Clinton	Smallpox	1		8	12	2	4	27
	Scarlet fever			1	1			2
Crawford	Smallpox	4				2	5	11
	Scarlet fever			3			1	4
	Diphtheria	4	8	1	4	1		18
	Smallpox	1	2	8	5			16
	Scarlet fever		1	1	1	16	1	20
	Diphtheria					2		2
	Smallpox		1		2	4	2	9
						2	2	4

TABLE NO. 2—Continued.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Dallas	Scarlet fever	2						2
	Diphtheria	6						6
	Smallpox	26	28	42	18	9	1	131
Davis	Scarlet fever	1		1		1		3
	Diphtheria	1	2		1			4
	Smallpox			6	6	1		13
	Cerebrospinal meningitis					1	1	2
Decatur	(No report)							
Delaware	Scarlet fever			1	1			2
	Diphtheria	1	1	2	7	8		19
	Smallpox						3	3
Des Moines	Scarlet fever	2		3	2			7
	Diphtheria		4		1			5
	Cerebrospinal meningitis		1					1
Dickinson	(No report)							
Dubuque	Scarlet fever			1				1
	Diphtheria	3			3	1		7
Emmet	Smallpox	13						13
Fayette	Scarlet fever		1			1	2	4
	Diphtheria				1			1
	Smallpox		1	3		1		5
	Cerebrospinal meningitis		1					1
Floyd	Scarlet fever				2			2
	Diphtheria				6			6
	Smallpox					1		1
Franklin	Scarlet fever		1			1		2
	Diphtheria	2					1	3
	Smallpox			3				3
Fremont	Scarlet fever				3			3
	Smallpox				1	5		6
	Anterior poliomyelitis						1	1
Greene	Smallpox				5			5
Grundy	Smallpox				1	8		9
Guthrie	Scarlet fever	4	1		1			6
	Smallpox				8	1	2	11
Hamilton	Diphtheria					1		1
	Smallpox	6				2	1	9
Hancock	Scarlet fever					2	2	4
	Diphtheria	1						1
	Smallpox	4			1	4		9
	Cerebrospinal meningitis				1			1
Hardin	Scarlet fever		2					2
	Smallpox					1		1
Harrison	Scarlet fever	1						1
	Diphtheria	1			1			2
	Smallpox	5		4				9
	Cerebrospinal meningitis	6						6
Henry	Scarlet fever	12	1					13
	Diphtheria	2		1	4		1	8
	Smallpox	1						1
Howard	Scarlet fever	6						6
Humboldt	Smallpox	1						1
Ida	Scarlet fever						1	1
	Diphtheria				1			1
	Smallpox				1	1		2
Iowa	Scarlet fever	3	1					4
	Diphtheria						1	1
	Smallpox		3	1				4
Jackson	Diphtheria			2				2
Jasper	Scarlet fever			4				4
	Diphtheria		2					2
	Smallpox	2		1	8			11
Jefferson	Scarlet fever	3						3
	Diphtheria	1		2		7	2	12
	Smallpox					1		1
Johnson	Scarlet fever	1			2			3
	Diphtheria		1			1		2
	Smallpox				25	2		27

TABLE NO. 2—Continued.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Jones	Scarlet fever		6	37	9			52
	Diphtheria				1	4	1	6
	Smallpox				1			1
Keokuk	Scarlet fever				1	1		2
	Smallpox	1	1					2
Kossuth	Diphtheria	1				1		2
	Smallpox	2				1	1	4
Lee	Scarlet fever		2		1			3
	Diphtheria	1		1				2
	Smallpox	2		4		1	13	20
Linn	Scarlet fever	3	19	30	35	30	11	137
	Diphtheria	1	1					2
	Smallpox	5	3	13	10	8	8	43
	Cerebrospinal meningitis		1	2	5	2	2	12
	Anterior poliomyelitis					1		1
Louisa	Smallpox		3	1	1			5
Lucas	(No report)							
Lyon	Scarlet fever					1		1
	Smallpox	1						1
	Cerebrospinal meningitis		1					1
Madison	Smallpox	1	3					4
Mahaska	Scarlet fever	6	7		2	7		22
	Diphtheria	6						6
	Smallpox		1	2				3
	Anterior poliomyelitis						2	2
Marion	Diphtheria			1				1
	Smallpox		1	5				6
Marshall	Scarlet fever			1	3	6		10
	Diphtheria					1		1
	Smallpox		1	1	14	8		24
Mills	Scarlet fever		1					1
	Diphtheria				3	4		7
	Smallpox				1			1
Mitchell	Scarlet fever	2	1					3
	Smallpox			6	13	3		22
Monona	Scarlet fever		1					1
	Diphtheria	6	3	1				10
	Smallpox	11	4	1	1			17
	Cerebrospinal meningitis	1						1
Monroe	Scarlet fever	2		2				4
	Diphtheria			1				1
	Smallpox						1	1
Montgomery	Smallpox	2	1					3
Muscatine	Scarlet fever	4	3	5				12
	Diphtheria	3						3
	Smallpox		9	6	2	2		19
O'Brien	Scarlet fever		2		1		1	4
Osceola	Scarlet fever					2		2
	Smallpox					8		8
Page	Scarlet fever	1						1
	Diphtheria	1				1		2
Palo Alto	Scarlet fever				2	1		3
	Diphtheria	1	1					2
	Smallpox			6				6
Plymouth	Scarlet fever		1					1
	Diphtheria						1	1
	Smallpox				1	6		7
Pocahontas	Scarlet fever		4				2	6
	Smallpox		3	1	1			5
Polk	Scarlet fever	9	10	11	8	5	3	46
	Diphtheria	47	45	24	22	7	9	154
	Smallpox	80	52	90	51	31	41	345
	Cerebrospinal meningitis			1				1
Pottawattamie	Scarlet fever	6	3	8	2	2		21
	Diphtheria	7	6	1	5			19
	Smallpox	5	10	14	4	12		45
	Cerebrospinal meningitis	3		1	2			6
Poweshiek	Scarlet fever		5					5
	Diphtheria		6	1				7
	Smallpox			1				1

TABLE NO. 2—Continued.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Ringgold	Diphtheria			1		5		6
	Smallpox				30			30
Sac	Scarlet fever				4	1		5
	Smallpox	1		4	10	1	3	19
Scott	Scarlet fever	1	5	2	3	4	2	17
	Diphtheria	2	8		10	6	5	31
	Smallpox		1		9	7	7	24
Shelby	Scarlet fever	3	1		2			6
	Smallpox		1			3		4
Sioux	Scarlet fever			2	3			5
	Diphtheria			1		2		3
	Smallpox	1			1			2
Story	Scarlet fever	1						1
	Diphtheria		2					2
	Smallpox	3	5	4	2	1	1	16
Tama	Scarlet fever		20					20
	Diphtheria		3					3
	Smallpox					9	2	11
Taylor	Scarlet fever				1			1
Union	Scarlet fever	5						5
Van Buren	Scarlet fever	8	6		1			15
	Diphtheria				11			11
Wapello	Scarlet fever	1						1
	Diphtheria				2			2
	Smallpox						1	1
	Cerebrospinal meningitis			1	1			2
Warren	Scarlet fever	1	5			1		7
	Diphtheria	4	2	1			1	8
	Cerebrospinal meningitis		1					1
Washington	Diphtheria	1					1	2
	Smallpox		1					1
Wayne	(No report)							
Webster	Scarlet fever	3	3			1		7
	Diphtheria	1						1
	Smallpox	38	55	59	64	31	10	257
Winnebago	Scarlet fever						2	2
	Diphtheria						1	1
	Smallpox	1	10	20	1			32
Winneshiek	Scarlet fever	4			1			5
	Smallpox			2	4			6
Woodbury	Scarlet fever					1		1
	Diphtheria					2		2
	Smallpox			7				7
Worth	Smallpox		3	1				4
Wright	Scarlet fever			1				1
	Diphtheria		1	3	3			7
Total		476	532	637	575	390	213	2,823

TABLE NO. 3.

QUARANTINABLE DISEASES REPORTED TO THIS OFFICE FROM JULY 1, 1913, TO JANUARY 1, 1914, ARRANGED ACCORDING TO COUNTIES.

COUNTY	DISEASE	July	August	September	October	November	December	Total
Adair	(No report)							
Adams	(No report)							
Allamakee	Smallpox						2	2
Appanoose	Scarlet fever					3		3
	Diphtheria			1	2	2	2	11
	Smallpox					5	3	8
Audubon	Diphtheria		2					2
	Smallpox						1	1
	Anterior poliomyelitis	1	1			1	1	4
Benton	Diphtheria	1		2	1			4
	Smallpox					1	1	2
Black Hawk	Scarlet fever		1		1			2
	Diphtheria					1		1
	Smallpox	2						2
Boone	Scarlet fever						1	1
	Diphtheria			1	2		7	10
	Smallpox	8				1	11	20
Bremer	Cerebrospinal meningitis		1					1
	Anterior poliomyelitis	1	3					4
Buchanan	Scarlet fever						1	1
Buena Vista	Scarlet fever		1					1
	Smallpox	4						4
Butler	Scarlet fever				1			1
	Cerebrospinal meningitis				1			1
Calhoun	Diphtheria			2				2
Carroll	Scarlet fever				1			1
	Diphtheria			1				1
	Smallpox					1	11	12
	Cerebrospinal meningitis				6			6
Cass	Scarlet fever				6	3	1	10
	Diphtheria						1	1
	Anterior poliomyelitis		2					2
Cedar	(No report)							
Cerro Gordo	Scarlet fever				1		1	2
	Diphtheria			1		1		2
Cherokee	(No report)							
Chickasaw	Scarlet fever	1						1
	Cerebrospinal meningitis	1						1
	Anterior poliomyelitis			2				2
Clarke	Scarlet fever					1		1
Clay	Scarlet fever		1		1			2
	Diphtheria	1	4	6	16	23	10	60
Clayton	Scarlet fever		6	3		1		10
	Diphtheria		1	1				2
	Smallpox					1		1
Clinton	Scarlet fever						5	5
	Diphtheria					2		2
	Smallpox					1	2	3
Crawford	Scarlet fever					1		1
	Diphtheria	1		1			1	3
	Smallpox			2	1	3	1	7
Dallas	Scarlet fever						1	1
	Diphtheria		2					2
	Smallpox					2	3	5
Davis	Diphtheria						1	1
	Smallpox					24	11	35
Decatur	(No report)							
Delaware	Scarlet fever				1	1		2
	Diphtheria					2		2

TABLE NO. 3—Continued.

COUNTY	DISEASE	July	August	September	October	November	December	Total
Des Moines	Scarlet fever				1	3		4
	Diphtheria	1		1	12	4	3	11
	Smallpox				5			5
Dickinson	Anterior poliomyelitis			1				1
	Diphtheria	1						1
	Smallpox					2		2
Dubuque	Anterior poliomyelitis			1				1
	Scarlet fever		1					1
	Diphtheria	1						1
	Smallpox				1	2		3
Emmet	Scarlet fever						7	7
	Smallpox						1	1
	Anterior poliomyelitis					1		1
Fayette	Scarlet fever				1			1
	Anterior poliomyelitis		2	3				5
Floyd	Scarlet fever				1		2	3
	Anterior poliomyelitis		1	1				2
Franklin	Scarlet fever			1				1
	Diphtheria		1					1
Fremont	Smallpox				1	2	5	8
Greene	Scarlet fever				1		1	2
Grundy	Diphtheria						3	3
Guthrie	Diphtheria				1		1	2
	Smallpox						2	2
Hamilton	(No report)							
Hancock	Diphtheria					1		1
Hardin	Scarlet fever					1		1
	Diphtheria	1		1	12	8		22
Harrison	Smallpox				1		2	3
Henry	Smallpox	1						1
Howard	Scarlet fever						1	1
Humboldt	Smallpox						3	3
Ida	Anterior poliomyelitis				1			1
Iowa	(No report)							
Jackson	Diphtheria	1						1
Jasper	Scarlet fever					1		1
	Diphtheria						2	2
	Smallpox	2			3	4	9	18
	Anterior poliomyelitis	1						1
Jefferson	Diphtheria				2		2	4
Johnson	Scarlet fever				1			1
	Smallpox						1	1
Jones	Scarlet fever						2	2
	Smallpox	3						3
Keokuk	Scarlet fever				6			6
	Diphtheria		1			1		2
	Smallpox						1	1
	Anterior poliomyelitis			1	1			2
Kossuth	Anterior poliomyelitis	1	2	2				5
Lee	Scarlet fever						7	7
	Smallpox					4		4
Linn	Scarlet fever	9		4	3		1	17
	Diphtheria	2	5	4	9	17	22	60
	Smallpox	4	1	1			4	10
	Cerebrospinal meningitis					1		1
	Anterior poliomyelitis	1	1					2
Louisa	(No report)							
Lucas	Diphtheria	5	1					6
Lyon	Scarlet fever	1						1
	Diphtheria					3		3
Madison	Smallpox						2	2
Mahaska	Scarlet fever		1				7	8
Marion	Scarlet fever						2	2
	Diphtheria	1		2	3	1	3	10
	Smallpox		6	3	2	9	11	31
Marshall	Diphtheria					1		1
Mills	Diphtheria				1			1
	Smallpox					1		1
Mitchell	(No report)							
Monona	(No report)							

TABLE NO. 3—Continued.

COUNTY	DISEASE	July	August	September	October	November	December	Total
Monroe	Scarlet fever						1	1
	Diphtheria	2			1	1	1	5
	Smallpox						2	2
Montgomery	(No report)							
Muscatine	Diphtheria					1		1
O'Brien	Scarlet fever						1	1
	Diphtheria		1					1
	Smallpox			1		2	4	7
Osceola	(No report)							
Page	Scarlet fever					6	9	15
Palo Alto	Scarlet fever						2	9
	Diphtheria						1	1
	Smallpox				1			1
	Anterior poliomyelitis	2	1					3
Plymouth	Scarlet fever						1	1
Pocahontas	Smallpox						2	2
Polk	Scarlet fever	1	2	10	17	41	23	94
	Diphtheria	2	7	11	10	8	13	51
	Smallpox	8	5	9	23	38	127	210
	Cerebrospinal meningitis		1					1
	Anterior poliomyelitis			1		1		2
Pottawattamie	Scarlet fever				6	25		31
	Diphtheria	1		5	13	26	1	46
	Smallpox	12		1	1	6		20
	Cerebrospinal meningitis	1				1		2
	Anterior poliomyelitis		1					1
Poweshiek	Diphtheria						1	1
	Anterior poliomyelitis			1				1
Ringgold	Diphtheria						1	1
	Anterior poliomyelitis		1					1
Sac	Smallpox	1						1
Scott	Scarlet fever			4	6	3	8	21
	Diphtheria			2	5	3	9	19
	Smallpox					2	4	6
	Anterior poliomyelitis			1				1
Shelby	Cerebrospinal meningitis		1					1
	Anterior poliomyelitis	2	1					3
Sioux	Diphtheria					2		2
	Smallpox				4	4	4	12
	Anterior poliomyelitis						1	1
Story	Diphtheria				2			2
	Smallpox			2		1	1	4
Tama	(No report)							
Taylor	Scarlet fever						1	1
Union	Scarlet fever						2	2
Van Buren	Diphtheria	5						5
Wapello	Scarlet fever			1	4		1	6
	Diphtheria				1			1
Warren	Scarlet fever				4			4
	Diphtheria				1		1	2
	Smallpox			1	2		8	11
Washington	Scarlet fever						1	1
	Smallpox			1	5	1		7
Wayne	Diphtheria						1	1
Webster	Scarlet fever					3	2	5
	Diphtheria					1	1	2
	Smallpox	1	3				1	5
	Anterior poliomyelitis		1					1
Winnebago	Diphtheria		2					2
	Anterior poliomyelitis	2						2
Winneshiek	Scarlet fever					2	8	10
Woodbury	Scarlet fever					2		2
	Smallpox	2						2
Worth	(No report)							
Wright	Scarlet fever				4	4		8
	Smallpox				3			3
Total		99	75	102	211	339	437	1,263

TABLE NO. 4.

QUARANTINABLE DISEASES REPORTED TO THIS OFFICE FROM JANUARY 1, 1914, TO JULY 1, 1914, ARRANGED ACCORDING TO COUNTIES.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Adair	Scarlet fever				1			1
	Smallpox		2		2	1		5
Adams	Scarlet fever				1			1
Allamakee	Scarlet fever		1	4	11	2		18
	Diphtheria			1				1
	Smallpox	5		2				7
Appanoose	Scarlet fever		5		8	1		14
	Smallpox	1		1				2
Audubon	Scarlet fever					4		4
	Diphtheria	1		2				3
	Smallpox		1	4				5
Benton	Scarlet fever	1	1	5	4			11
	Diphtheria			1	4			5
	Smallpox	33	8	3	4			48
	Anterior poliomyelitis				1			1
Black Hawk	Scarlet fever	8			6	3		17
	Smallpox	1			3			4
Boone	Scarlet fever	8	5	12	29	12	2	68
	Diphtheria	2	2	4	1	1	1	11
	Smallpox	42	31	44	24	15	2	158
Bremer	Scarlet fever	1				7		8
	Smallpox			1				1
Buchanan	Scarlet fever	2	9	1		1	2	15
	Diphtheria	1						1
	Smallpox		1	7	4	11		23
Buena Vista	Scarlet fever			6	1			7
	Smallpox	1	3	2	3			10
Butler	Scarlet fever	5	1					6
	Smallpox			2	1			3
	Cerebrospinal meningitis				1			1
Calhoun	Diphtheria				1			1
	Smallpox					3		3
Carroll	Scarlet fever					1		1
	Diphtheria				4			4
	Smallpox	8		3	2		3	16
	Cerebrospinal meningitis				1			1
Cass	Scarlet fever	1	2		1	1		5
	Diphtheria	1	1	2				4
	Smallpox	1		5		1		7
Cedar	Diphtheria				1			1
	Cerebrospinal meningitis			1	1			2
Cerro Gordo	Scarlet fever			2				2
	Diphtheria		1					1
	Smallpox		6		1		2	9
	Anterior poliomyelitis					1		1
Cherokee	Scarlet fever				1			1
	Diphtheria					1		1
Chickasaw	Scarlet fever		2					2
	Diphtheria	1		1	1			3
	Smallpox			1				1
Clarke	Scarlet fever		1			2		3
	Smallpox	20			8			28
Clay	Diphtheria	3	7	2		4	4	20
	Smallpox	5	3	4		2	2	16
Clayton	Scarlet fever	10	7	5	6	2		30
	Smallpox		1			2	1	4
	Anterior poliomyelitis				1			1
Clinton	Scarlet fever		1	1	3			5
	Diphtheria	1	1					2
	Smallpox			11	2			13

TABLE NO. 4—Continued.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Crawford	Scarlet fever				1			1
	Smallpox	3	4		1		2	10
Dallas	Scarlet fever		2	4		6		12
	Diphtheria						1	1
	Smallpox	2	3	3		2	1	11
Davis	Scarlet fever	6	1					7
	Smallpox	4	7	3				14
Decatur	Smallpox				1			1
Delaware	Scarlet fever				1			1
	Diphtheria			1	1			2
	Smallpox					3	4	7
Des Moines	Scarlet fever	2	2	1				5
	Diphtheria	1				2		3
	Smallpox			3		2		5
	Anterior poliomyelitis					1		1
Dickinson	Scarlet fever				3		1	4
	Smallpox	10	2	3		1		16
Dubuque	Smallpox	10	5		42			63
Emmet	Scarlet fever		1					1
	Smallpox	1	5		2			8
Fayette	Scarlet fever			1	8	1		10
	Smallpox		1	14	2	8	3	28
	Cerebrospinal meningitis			1				1
Floyd	Smallpox					3	1	4
Franklin	Scarlet fever	1			1	2		4
	Smallpox		4	1				5
Fremont	Scarlet fever	1						1
	Smallpox	8						8
	Cerebrospinal meningitis		1					1
Greene	Diphtheria				1	3		4
	Smallpox			24				24
Grundy	Scarlet fever		5	1				6
	Smallpox		16		4	1		21
Guthrie	Scarlet fever			4				4
	Diphtheria	1						1
	Smallpox	3	1			2	8	14
Hamilton	Scarlet fever	1						1
	Diphtheria	3	7			1		11
	Smallpox	7		3	2	10	1	23
Hancock	Diphtheria		5					5
	Smallpox					2		2
Hardin	Diphtheria	3			2	1		6
	Smallpox	7	1	4	5			17
Harrison	Scarlet fever			2				2
	Diphtheria	1		1				2
	Smallpox		7	5				12
Henry	Smallpox		6	7	3			16
Howard	Scarlet fever	2	2	1	1	4		10
Humboldt	Smallpox	3	1					4
Ida	(No report)							
Iowa	Scarlet fever		1					1
	Diphtheria		1					1
	Smallpox					1	1	2
Jackson	Scarlet fever			1	2			3
	Diphtheria			3				3
	Smallpox				2	1		3
Jasper	Scarlet fever		2	3	2			7
	Diphtheria			2	1	17	35	55
	Smallpox	41	40	28	16	6	4	135
Jefferson	Scarlet fever					1		1
	Smallpox		1	4	3			8
Johnson	Diphtheria	1	1					2
	Smallpox	2	4	4	7	2	1	20
Jones	Scarlet fever		3	4				7
	Diphtheria		2					2
	Smallpox				1	3		4
Keokuk	Scarlet fever		5					5
	Diphtheria	4	20					24
	Smallpox	8		4	1			13

TABLE NO. 4—Continued.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Kossuth	Scarlet fever	7				1		8
	Diphtheria			1				1
	Smallpox			4				4
Lee	Scarlet fever	5	2			3		10
	Diphtheria					13		13
	Smallpox	1	10		13	11		35
Linn	Scarlet fever	4	7	6	7			24
	Diphtheria	20	12	20	10		11	73
	Smallpox	5	6	9	8		10	38
Louisa	Scarlet fever		4		1			5
	Smallpox		6	12	4			22
Lucas	Diphtheria			1				1
	Smallpox			2	2			4
Lyon	Scarlet fever		1					1
	Diphtheria			4				4
	Smallpox		6	8			27	36
Madison	Scarlet fever	1						1
	Smallpox	16	1	1	9			27
Mahaska	Smallpox		6	1		1		8
Marion	Scarlet fever	1						1
	Diphtheria	1	5	1	1			8
	Smallpox	15	13	10	11	11		60
Marshall	Diphtheria			1				1
	Smallpox				2			2
Mills	Scarlet fever	21		1				22
	Smallpox					1		1
Mitchell	Scarlet fever		1				2	3
	Smallpox						1	1
Monona	Scarlet fever		1					1
	Diphtheria		1					1
	Smallpox	3	8	2		1	1	15
Monroe	Scarlet fever		1		8	1		10
	Diphtheria	2			2			4
	Smallpox		8	16	17	3	1	45
Montgomery	Diphtheria		1					1
Muscatine	Scarlet fever				1			1
	Diphtheria	1			1			2
	Smallpox		34	44	9	3		90
O'Brien	Scarlet fever					3		3
	Smallpox	33		1				34
Osceola	Scarlet fever			2		1		3
	Diphtheria	4	5		1		1	11
	Smallpox			7	16	4		27
Page	Scarlet fever	9	2	1	5	1		18
	Diphtheria			4	3	10	2	19
	Smallpox	2				1		3
Palo Alto	Scarlet fever		1	3				4
	Diphtheria						1	1
	Smallpox		3	5		1	1	10
Plymouth	Scarlet fever	2	7		6	5		20
	Smallpox				1			1
Pocahontas	Scarlet fever						1	1
	Diphtheria				2			2
Polk	Scarlet fever	27	20	40	40	16	19	162
	Diphtheria	26	12	32	20	1	6	97
	Smallpox	171	151	176	163	120	54	835
Pottawattamie	Scarlet fever	4		16		22		42
	Diphtheria			15		8	1	24
	Smallpox	1		15		27	9	52
	Cerebrospinal meningitis			1				1
Poweshiek	Smallpox	1		2	1	1		5
Ringgold	Scarlet fever					2		2
	Diphtheria						2	2
	Smallpox	13	1					14
	Anterior poliomyelitis	2						2
Sac	Diphtheria					1		1
	Smallpox				1	3		4

TABLE NO. 4—Continued.

COUNTY	DISEASE	January	February	March	April	May	June	Total
Scott	Scarlet fever		3	4	2		4	13
	Diphtheria	6	8	3	6	7	4	34
	Smallpox	3	6	11	14	17	25	76
	Anterior poliomyelitis					2		2
Shelby	Scarlet fever	1	2	1		2		6
	Diphtheria	2		1		1		4
	Smallpox		3	13	1		1	18
Sioux	Scarlet fever			2				2
	Smallpox	2	9	37	11	8		67
Story	Scarlet fever	1						1
	Diphtheria	1		2		1		4
	Smallpox	6	7	13	3			29
	Cerebrospinal meningitis	1						1
Tama	Diphtheria						1	1
	Smallpox				1	1	5	7
Taylor	(No report)							
Union	Scarlet fever	3	1			1		5
	Smallpox		7			1		8
Van Buren	Scarlet fever			2				2
Wapello	Scarlet fever	1	1		2			4
	Diphtheria			1				1
	Smallpox		1	1	1			3
Warren	Scarlet fever			1		1	1	3
	Diphtheria						4	4
	Smallpox	2	9	2	1	5		19
Washington	Diphtheria		2					2
	Smallpox	20	9		1		7	37
Wayne	Scarlet fever			2				2
	Diphtheria	1		1				2
	Smallpox	1		15	24	4		44
Webster	Scarlet fever	3	2	3	2			10
	Diphtheria	2	1		2			5
	Smallpox	8	1	14	7		2	32
Winnebago	Scarlet fever		1	2	16			19
	Smallpox					5		5
Winneshiek	Scarlet fever			1	6	1		8
	Diphtheria						1	1
	Smallpox					2		2
Woodbury	Scarlet fever	2	1	2				5
	Diphtheria	2					1	3
	Smallpox	2		4				6
Worth	Scarlet fever		1	3	3			7
Wright	Scarlet fever				7	3		10
	Diphtheria			1				1
	Smallpox			5				5
	Cerebrospinal meningitis		1	1				2
Total		773	693	889	733	502	279	3,869

DE

	Other diseases of liver	Traumatism by other crushing	Railroad accidents	Street car accidents	Automobile accidents	Motorcycle accidents	Injuries by other vehicles	Injuries by animals	Starvation	Excessive cold	Effects of heat	Other external violence	Lightning	Electricity (except lightning)	Fractures	Homicide	Not specified or ill-defined
Janua	1	5	15				1	1	2	2		2			14	1	38
Febru	1	6	8					1		1		1			14	3	26
March	2	4	15	1			1	3				1		1	15	2	37
April	2	5	11	1			2	2				1			19	4	27
May	2	3	12	2	2		1	3			1	3	3	1	16	3	31
June	2	6	17	1	1	2	1	2			2				21	15	24
July	1	4	20	3	4	1	3	4			4		6	4	6	2	18
Augus	2	6	33		5	1	1	4			3	3	2		14	5	13
Septen	2	4	26		5	1	3	4			6	9	1	1	5	14	16
Octob	2	4	23	1	5		5	3				7	2		10	6	13
Noven	1		18		5		6	1				3	1		7	7	10
Decem	1	3	19		4		4	2		3		7			7	8	15
	17	22	50	217	9	31	5	28	30	2	6	16	37	15	7	148	70	268

Grand Total, 20,901

	Other diseases of liver	Traumatism by other crushing	Railroad accidents	Street car accidents	Automobile accidents	Motorcycle accidents	Injuries by other vehicles	Injuries by animals	Starvation	Excessive cold	Effects of heat	Other external violence	Lightning	Electricity (except lightning)	Fractures	Homicide	Not specified or ill-defined
Janua	1	2	30		2		7	4	1	3		5		1	2	2	19
Febru	1	2	13		1		4	3		2		4		2	1	4	27
March	1	6	20	3	1		2	2	3	1		25			9	9	43
April	2	2	17	2			2	1	1			10	1		3	4	32
May	2	3	18	1	4		4	6			4	7	5	2	2	6	19
June	1	4	32		8		2	4			8	2	2		2	5	30
July	2	1	17	2	7	1	11	3	2		16	3		2	3	9	25
Augus	1	4	36		11		6	5			8	3	1	3	3	7	30
Septen	1	2	24		12		11	7	1		5	2	2	2	1	8	24
Octob	1	2	23	1	15		7	3				8		3		6	21
Noven	1	5	20		8		4	4				10			1	4	33
Decem	2	2	24	1	11		3	2				4			5	2	34
	21	35	274	10	80	1	63	44	8	6	41	83	11	15	32	66	345

Grand total, 22,473

TABLE NO. 1.

REPORT OF DEATHS FROM JULY 1, 1912, TO JANUARY 1, 1913, CLASSIFIED WITH REFERENCE TO DISEASES.

	July	August	September	October	November	December
Typhoid fever	17	19	30	38	24	24
Malarial fever	----	----	----	----	----	1
Measles	----	----	----	----	----	1
Scarlet fever	1	----	1	2	1	1
Whooping cough	12	7	12	4	12	13
Diphtheria and croup	3	1	14	23	15	15
Influenza	1	3	----	3	4	9
Erysipelas	4	1	4	2	3	3
Septicaemia	16	11	9	10	10	11
Pellagra	1	----	----	----	2	----
Tetanus	3	5	2	5	2	3
Tuberculosis of lungs	87	93	66	69	81	104
Tuberculous meningitis	9	3	3	2	3	3
Pott's disease	2	2	2	----	----	----
Other forms of tuberculosis	17	17	14	6	17	12
Venereal diseases	5	----	4	3	1	3
Cancer and other malignant tumors	122	122	139	139	132	115
Acute articular rheumatism	7	13	15	7	12	8
Diabetes	17	22	17	30	25	24
Exophthalmic goitre	3	1	4	----	2	2
Leuchaemia	5	4	4	3	4	2
Anaemia, chlorosis	13	13	12	18	18	12
Other general diseases	17	20	36	14	12	9
Alcoholism	4	1	5	9	7	5
Chronic occupation poisonings	----	----	1	----	1	----
Simple meningitis	9	7	10	8	10	14
Cerebrospinal meningitis	9	6	5	1	6	2
Locomotor ataxia	4	3	5	----	2	3
Acute anterior poliomyelitis	1	1	10	10	3	1
Cerebral hemorrhage, apoplexy	84	96	70	122	131	140
Softening of the brain	2	3	1	3	2	2
Paralysis	34	41	27	29	27	37
General paralysis of insane	8	7	9	9	7	9
Other forms of mental alienation	1	4	5	2	6	2
Epilepsy	5	10	9	9	6	4
Convulsions (nonpuerperal)	----	1	----	----	----	1
Convulsions of infants	11	9	9	12	9	11
Chorea	1	1	1	----	----	----
Neuralgia and neuritis	2	1	1	1	1	1
Other diseases of nervous system	9	17	11	12	15	14
Diseases of the ears	----	1	----	2	1	2
Acute endocarditis	11	16	11	8	7	3
Organic diseases of heart	138	141	128	142	143	175
Angina pectoris	11	10	11	15	14	11
Diseases of arteries, atheroma, aneurysm, etc.	35	40	43	28	32	37
Embolism and thrombosis	7	4	6	11	13	16
Hemorrhage, other diseases of circulatory system	7	4	5	4	7	10
Bronchitis	16	11	14	31	26	20
Bronchopneumonia	12	10	6	19	17	43
Pneumonia	43	21	36	89	91	107
Pulmonary congestion	8	7	10	16	5	29
Asthma	4	3	4	6	9	5
Other diseases of respiratory system	9	7	6	4	7	13
Ulcer of stomach	4	3	9	5	5	8
Other diseases of stomach	11	26	25	25	27	27
Diarrhoea and enteritis (under 2 years)	30	70	95	36	24	17
Diarrhoea and enteritis (2 years and more)	12	26	42	17	9	8
Appendicitis and typhlitis	11	6	15	20	19	12
Hernia and intestinal obstruction	28	16	22	22	32	25
Cirrhosis of liver	15	12	15	8	15	16
Other diseases of liver	19	24	15	15	15	14

TABLE NO. 1—Continued.

	July	August	September	October	November	December
Peritonitis	18	25	19	13	7	14
Other diseases of digestive system	3	11	8	3	11	13
Acute nephritis and Bright's disease	101	81	93	108	116	126
Other diseases of kidneys	2	5	4	3	6	8
Diseases of the bladder	6	6	4	7	4	5
Diseases of prostate	7	2	10	7	6	9
Noncancerous tumors and other diseases of female genital organs	3	5	3	3	6	3
Puerperal septicaemia	5	3	4	4	6	3
Other puerperal diseases	19	7	15	8	15	13
Gangrene	13	8	3	5	4	7
Other diseases of the skin and annexa	5	2	1	2	2	3
Diseases of bones and organs of locomotion	1	1	2	3	2	2
Malformations and injuries at birth	17	14	15	25	22	22
Premature birth	46	44	57	52	43	44
Congenital debility, atrophy, marasmus, etc.	23	23	35	33	20	28
Other causes peculiar to early infancy	13	18	14	6	19	11
Senility	69	75	87	98	84	58
Suicide	27	24	18	23	23	22
Poisoning by food, accident	2	1				
Other acute poisoning	3	10	2	4	2	5
Burns	5	7	7	10	14	11
Absorption of deleterious gases. Suffocation	2	2	1	6	5	2
Accidental drowning	23	19	16	7	1	5
Traumatism by firearms	7	2	1	4	8	8
Traumatism by cutting or piercing instruments	2					
Traumatism by fall	6	19	14	14	17	14
Traumatism in mines	1	2	4	2	3	
Traumatism by machines	1		2	2	1	2
Traumatism by other crushing	4	6	4	4		3
Railroad accidents	20	33	26	23	18	19
Street car accidents	3			1		
Automobile accidents	4	5	5	5	5	4
Motorcycle accidents	1	1	1			
Injuries by other vehicles	3	1	3	5	6	4
Injuries by animals	4	4	4	3	1	2
Excessive cold						3
Effects of heat	4	3	6			
Other external violence		3	9	7	3	7
Lightning	6	2	1	2	1	
Electricity (except lightning)	4		1			
Fractures	6	14	5	10	7	7
Homicide	2	5	14	6	7	8
Not specified or ill-defined	18	13	16	13	10	15
Total	1,486	1,535	1,619	1,659	1,636	1,789

REPORT OF DEATHS FROM JULY 1, 1912, TO JANUARY 1, 1913, CLASSIFIED WITH REFERENCE TO AGES.

Under 1 year	211	196	247	212	197	230
1 to 5 years	53	101	120	60	82	66
5 to 10 years	27	22	25	42	26	29
10 to 20 years	72	81	69	82	62	57
20 to 30 years	100	105	125	96	94	97
30 to 40 years	110	101	95	111	106	131
40 to 50 years	132	120	105	133	119	141
50 to 60 years	141	162	158	170	179	184
60 to 70 years	188	204	197	205	261	268
70 to 80 years	251	259	287	308	281	325
80 to 90 years	154	149	151	204	190	213
90 years and over	34	25	34	34	30	26
Unknown	4	10	6	4	9	3
Total	1,486	1,535	1,619	1,659	1,636	1,789

TABLE NO. 1—Continued.

REPORT OF DEATHS FROM JULY 1, 1912, TO JANUARY 1, 1913, CLASSIFIED WITH REFERENCE TO SEX.

	July	August	September	October	November	December
Male	793	876	870	933	944	968
Female	693	659	749	726	692	821
Total	1,486	1,535	1,619	1,659	1,636	1,789

REPORT OF DEATHS FROM JULY 1, 1912, TO JANUARY 1, 1913, CLASSIFIED WITH REFERENCE TO COLOR.

White	1,464	1,520	1,596	1,638	1,611	1,766
Colored	22	15	23	21	25	23
Total	1,486	1,535	1,619	1,659	1,636	1,789

REPORT OF DEATHS FROM JULY 1, 1912, TO JANUARY 1, 1913, CLASSIFIED WITH REFERENCE TO NATIVITY.

Native	1,090	1,130	1,216	1,245	1,219	1,333
Foreign	360	367	366	379	383	425
Unknown	36	38	37	35	34	31
Total	1,486	1,535	1,619	1,659	1,636	1,789

REPORT OF DEATHS FROM JULY 1, 1912, TO JANUARY 1, 1913, CLASSIFIED WITH REFERENCE TO SOCIAL RELATIONS.

Single	497	538	615	536	604	572
Married	638	635	622	688	731	747
Widowed	307	319	322	384	300	432
Divorced	16	16	30	26	21	27
Unknown	28	27	30	25	20	11
Total	1,486	1,535	1,619	1,659	1,636	1,789
*Stillbirths	57	69	58	54	66	69

*Stillbirths are not included in the foregoing classifications of deaths.

TABLE NO. 2.

REPORT OF DEATHS FROM JANUARY 1, 1913, to JULY 1, 1913, CLASSIFIED WITH REFERENCE TO DISEASES.

	January	February	March	April	May	June
Typhoid fever	23	13	11	13	19	20
Malarial fever						1
Smallpox		3		1		
Measles	2	9	24	32	29	8
Scarlet fever	13	7	14	9	5	1
Whooping cough	7	14	12	12	21	13
Diphtheria and croup	32	18	11	12	9	5
Influenza	63	48	39	18	11	2
Erysipelas	6	8	8	10	10	3
Other epidemic diseases		1	1		1	
Septicaemia	7	13	15	23	13	21
Tetanus	2	2	1	4	7	4
Tuberculosis of lungs	121	87	106	117	103	104
Tuberculous meningitis	8	5	6	9	16	7
Pott's disease	2	2	1	2		3
Other forms of tuberculosis	11	8	10	9	17	11
Venereal diseases		1	3	3	4	2
Cancer and other malignant tumors	143	131	131	119	135	149
Acute articular rheumatism	14	5	11	9	4	7
Diabetes	41	28	36	30	22	24
Exophthalmic goitre	1		5		1	3
Leuchaemia	5	2	2	2	5	3
Anaemia, chlorosis	27	21	14	15	27	23
Other general diseases	6	4	13	16	8	14
Alcoholism	5	5	5	11	8	9
Simple meningitis	18	16	26	18	18	25
Cerebrospinal meningitis	8	8	6	10	4	5
Locomotor ataxia	3	1	3	3	5	3
Acute anterior poliomyelitis	2	1			1	2
Cerebral hemorrhage, apoplexy	161	134	134	134	135	109
Softening of the brain	2	4	4	2	2	4
Paralysis	31	33	30	31	23	14
General paralysis of insane	5	10	8	6	5	16
Other forms of mental alienation	3	6	5	6	8	5
Epilepsy	5	1	5	6	6	5
Convulsions (nonpuerperal)	4	1	2			
Convulsions of infants	7	17	18	14	10	8
Neuralgia and neuritis	2		1	1		1
Other diseases of nervous system	22	18	25	15	19	15
Diseases of the ears	2	2			1	
Acute endocarditis	9	18	19	13	13	10
Organic diseases of heart	237	202	204	198	160	159
Angina pectoris	13	16	21	13	9	7
Diseases of arteries, atheroma, aneurysm, etc.	43	47	37	38	32	37
Embolism and thrombosis	8	12	14	11	14	17
Hemorrhage; other diseases of circulatory system	3	11	4	10	7	8
Bronchitis	57	44	43	20	18	18
Bronchopneumonia	78	92	80	42	25	14
Pneumonia	208	333	200	168	126	70
Pulmonary congestion	21	20	23	11	14	10
Asthma	9	8	10	3	7	3
Other diseases of respiratory system	14	21	15	10	11	7
Ulcer of stomach	8	3	6	6	8	3
Other diseases of stomach	23	20	42	29	29	26
Diarrhoea and enteritis (under 2 years)	21	25	15	17	13	25
Diarrhoea and enteritis (2 years and more)	6	7	10	10	8	15
Appendicitis and typhlitis	29	18	25	14	24	18
Hernia and intestinal obstruction	26	18	15	23	19	25
Cirrhosis of liver	22	15	17	14	10	4
Other diseases of liver	17	17	15	26	28	12
Peritonitis	10	7	17	16	19	18

TABLE NO. 2—Continued.

	January	February	March	April	May	June
Other diseases of digestive system	6	5	9	8	4	12
Acute nephritis and Bright's disease	163	135	138	134	130	109
Other diseases of kidneys	6	10	9	6	3	5
Diseases of the bladder	6	4	13	9	11	3
Diseases of prostate	10	10	10	7	4	4
Noncancerous tumors and other diseases of female genital organs	5	6	5	6	6	1
Puerperal septicaemia	12	8	9	9	9	3
Other puerperal diseases	11	10	16	12	10	12
Gangrene	8	7	13	11	7	6
Other diseases of the skin and annexa		2		5	2	
Diseases of bones and organs of locomotion	2	3	3	1	1	
Malformations and injuries at birth	43	38	22	28	28	24
Premature birth	47	44	41	35	43	54
Congenital debility, atrophy, marasmus, etc.	33	27	38	35	33	13
Other causes peculiar to early infancy	7	8	9	9	12	6
Senility	8	71	100	78	101	68
Suicide	12	18	32	21	23	34
Poisoning by food, accident		3				
Other acute poisonings	3	3	3	3	1	7
Burns	15	10	14	6	4	10
Absorption of deleterious gases. Suffocation	8	5	6	2	5	2
Accidental drowning	1	1	5	8	16	37
Traumatism by firearms	5	2	4	3	3	1
Traumatism by cutting or piercing instruments			2			1
Traumatism by fall	10	18	11	5	6	12
Traumatism in mines	3	2	2	3	1	1
Traumatism by machines	5	5	1	2	1	3
Traumatism by other crushing	2	2	6	2	3	4
Railroad accidents	30	13	20	17	18	32
Street car accidents			3	2	1	
Automobile accidents	2	1	1		4	8
Injuries by other vehicles	7	4	2	2	4	2
Injuries by animals	4	3	2	1	6	4
Starvation	1		3	1		
Excessive cold	3	2	1			
Excessive heat					4	8
Other external violence	5	4	25	10	7	2
Lightning				1	5	1
Electricity (except lightning)	1	2			2	
Fractures	2	1	2	3	2	3
Homicide	2	4	2	4	6	5
Not specified or ill-defined	19	27	43	32	18	20
Total	2,306	2,166	2,307	1,930	1,845	1,682

REPORT OF DEATHS FROM JANUARY 1, 1913, to JULY 1, 1913, CLASSIFIED WITH REFERENCE TO AGES.

Under 1 year	310	300	335	235	237	200
1 to 5 years	93	99	131	109	108	88
5 to 10 years	41	33	55	41	60	26
10 to 20 years	91	68	70	91	78	59
20 to 30 years	160	122	147	130	132	137
30 to 40 years	127	123	144	130	127	129
40 to 50 years	163	129	163	121	127	132
50 to 60 years	218	200	199	203	181	187
60 to 70 years	318	289	319	264	230	229
70 to 80 years	448	382	408	337	315	281
80 to 90 years	319	296	295	212	230	180
90 years and over	47	53	49	37	20	25
Unknown	31	12	16	18	8	9
Total	2,306	2,166	2,307	1,930	1,845	1,682

TABLE NO. 2—Continued.

REPORT OF DEATHS FROM JANUARY 1, 1913, to JULY 1, 1913, CLASSIFIED WITH REFERENCE TO SEX.

	January	February	March	April	May	June
Male	1,270	1,162	1,219	1,028	1,020	933
Female	1,096	1,004	1,088	902	825	749
Total	2,366	2,166	2,307	1,930	1,845	1,682

REPORT OF DEATHS FROM JANUARY 1, 1913, to JULY 1, 1913, CLASSIFIED WITH REFERENCE TO COLOR.

White	2,346	2,137	2,281	1,899	1,813	1,654
Colored	20	29	26	31	32	28
Total	2,366	2,166	2,307	1,930	1,845	1,682

REPORT OF DEATHS FROM JANUARY 1, 1913, to JULY 1, 1913, CLASSIFIED WITH REFERENCE TO NATIVITY.

Native	1,730	1,622	1,710	1,441	1,425	1,263
Foreign	589	494	559	459	386	381
Unknown	47	40	38	30	34	38
Total	2,366	2,166	2,307	1,930	1,845	1,682

REPORT OF DEATHS FROM JANUARY 1, 1913, to JULY 1, 1913, CLASSIFIED WITH REFERENCE TO SOCIAL RELATIONS.

Single	760	744	805	668	636	564
Married	967	853	925	792	757	695
Widowed	587	538	537	436	409	398
Divorced	22	21	12	14	16	20
Unknown	30	15	28	26	27	30
Total	2,366	2,166	2,307	1,930	1,845	1,682
*Stillbirths	79	65	66	69	65	61

*Stillbirths are not included in the foregoing classification of deaths.

TABLE NO. 3.

REPORT OF DEATHS FROM JULY 1, 1913, TO JANUARY 1, 1914, CLASSIFIED WITH REFERENCE TO DISEASES.

	July	August	September	October	November	December
Typhoid fever	15	23	31	32	22	25
Malarial fever	1	2		1		1
Smallpox					1	
Measles	6	1	1	1	1	3
Scarlet fever	2	2	2	2	7	7
Whooping cough	6	9	5	4	4	4
Diphtheria and croup	7	8	7	14	10	29
Influenza	3		3	4	5	7
Erysipelas	4	1	2	2	4	6
Septicaemia	10	14	8	6	9	15
Rabies				1		
Pellagra						1
Tetanus	1	5	5	5	7	1
Tuberculosis of lungs	93	90	75	85	66	91
Tuberculous meningitis	11	2	8	7	3	6
Pott's disease		2	1	1	2	1
Other forms of tuberculosis	10	12	16	20	14	11
Venereal diseases	4	1	3		1	2
Cancer and other malignant tumors	139	121	148	108	144	111
Acute articular rheumatism	6	3	12	3	8	3
Diabetes	19	24	25	22	30	26
Exophthalmic goitre				1	1	4
Leuchaemia	5	1		5	4	4
Anaemia, Chlorosis	14	16	18	16	17	15
Other general diseases	10	40	35	17	9	14
Alcoholism	2	5	3	5	10	5
Simple meningitis	14	21	22	15	16	20
Cerebrospinal meningitis		4	2	1	4	2
Locomotor ataxia	1	3	1	3	3	6
Acute anterior poliomyelitis	1	11	4	3	3	
Cerebral hemorrhage, Apoplexy	99	103	104	117	148	148
Softening of the brain	1	5	2	4	4	4
Paralysis	24	38	25	21	21	25
General paralysis of insane	6	8	9	5	9	13
Other forms of mental alienation	4	1	6	1	3	4
Epilepsy	8	3	7	6	6	10
Convulsions (nonpuerperal)	1	4			1	1
Convulsions of infants	7	8	10	17	7	9
Chorea						1
Neuralgia and neuritis	1					3
Other diseases of nervous system	19	29	19	8	21	14
Diseases of the ears					1	1
Acute endocarditis	16	13	17	9	8	6
Organic diseases of heart	135	149	138	157	159	174
Angina pectoris	8	9	11	9	17	17
Diseases of arteries, atheroma, aneurysm, etc.	31	31	42	34	41	34
Embolism and thrombosis	10	15	16	12	11	18
Hemorrhage; other diseases of circulatory system	11	4	4	6	3	4
Bronchitis	11	7	14	20	16	19
Bronchopneumonia	7	7	9	14	19	28
Pneumonia	38	39	44	72	110	117
Pulmonary congestion	10	9	12	14	7	11
Asthma		4	2	1	9	5
Other diseases of respiratory system	6	8	14	8	9	8
Ulcer of stomach	5	8	6	6	10	5
Other diseases of stomach	26	25	35	28	21	19
Diarrhoea and enteritis (under 2 years)	45	141	115	40	17	13
Diarrhoea and enteritis (2 years and more)	18	68	58	27	12	5
Appendicitis and typhlitis	19	19	15	23	17	13

TABLE NO. 3—Continued.

	July	August	September	October	November	December
Hernia and intestinal obstruction	14	31	30	18	25	23
Cirrhosis of liver	10	15	14	17	10	13
Other diseases of liver	23	15	19	15	11	29
Peritonitis	11	16	17	18	11	19
Other diseases of digestive system	11	8	7	6	9	13
Acute nephritis and Bright's disease	128	118	119	103	128	122
Other diseases of kidneys	7	3	3	2	4	5
Diseases of the bladder	2	7	6	7	9	5
Diseases of prostate	5	5	8	4	9	7
Noncancerous tumors and other diseases of female genital organs	5	2	5	2	2	3
Puerperal septicaemia	5	3	3	7	4	7
Other puerperal diseases	5	7	7	4	7	6
Gangrene	4	5	4	4	4	5
Other diseases of the skin and annexa	3	2	3	3	2	1
Diseases of bones and organs of locomotion		4	2	2	1	3
Malformations and injuries at birth	32	16	20	21	31	30
Premature birth	49	46	53	34	45	58
Congenital debility, atrophy, marasmus, etc.	35	32	47	44	29	28
Other causes peculiar to early infancy	7	8	9	7	5	6
Senility	64	73	74	76	52	56
Suicide	27	28	20	23	29	24
Poisoning by food, accident		1			2	
Other acute poisonings	5	3	3	4		2
Burns	5	15	7	11	12	11
Absorption of deleterious gases. Suffocation	3	4	6	2	3	11
Accidental drowning	26	28	8	6	2	1
Traumatism by firearms	1	1	2	4	4	4
Traumatism by cutting or piercing instruments	2	1		1	1	
Traumatism by fall	18	20	18	12	13	12
Traumatism in mines	2		3	3	2	2
Traumatism by machines	2	2	5	2	2	3
Traumatism by other crushing	1	4	2	2	5	2
Railroad accidents	17	36	24	23	20	24
Street car accidents	2			1		1
Automobile accidents	7	11	12	15	8	11
Motorcycle accidents	1					
Injuries by other vehicles	11	6	11	7	4	3
Injuries by animals	3	5	7	3	4	2
Starvation	2		1			
Effects of heat	16	8	5			
Other external violence	3	3	2	8	10	4
Lightning		1	2			
Electricity	2	3	2	3		
Fractures	3	3	1		1	5
Homicide	9	7	8	6	4	2
Not specified or ill-defined	25	39	24	21	33	31
Total	1,563	1,811	1,794	1,603	1,669	1,737

REPORT OF DEATHS FROM JULY 1, 1913, TO JANUARY 1, 1914, CLASSIFIED WITH REFERENCE TO AGES.

Under 1 year	223	200	301	222	187	235
1 to 5 years	64	141	133	71	69	65
5 to 10 years	24	39	28	33	26	30
10 to 20 years	71	89	70	63	67	56
20 to 30 years	100	133	113	112	104	120
30 to 40 years	108	116	102	121	113	127
40 to 50 years	125	116	122	118	117	135
50 to 60 years	154	169	175	160	104	173
60 to 70 years	208	212	197	217	253	256
70 to 80 years	291	287	317	265	287	317
80 to 90 years	168	174	198	179	209	181
90 years and over	26	28	29	31	38	33
Unknown	11	17	9	11	5	9
Total	1,563	1,811	1,794	1,603	1,669	1,737

TABLE NO. 3—Continued.

REPORT OF DEATHS FROM JULY 1, 1913, TO JANUARY 1, 1914, CLASSIFIED WITH REFERENCE TO SEX.

	July	August	September	October	November	December
Male	845	1,016	900	903	905	954
Female	718	795	894	700	764	783
Total	1,563	1,811	1,794	1,603	1,669	1,737

REPORT OF DEATHS FROM JULY 1, 1913, TO JANUARY 1, 1914, CLASSIFIED WITH REFERENCE TO COLOR.

White	1,535	1,781	1,766	1,582	1,638	1,720
Colored	28	30	28	21	31	17
Total	1,563	1,811	1,794	1,603	1,669	1,737

REPORT OF DEATHS FROM JULY 1, 1913, TO JANUARY 1, 1914, CLASSIFIED WITH REFERENCE TO NATIVITY.

Native	1,156	1,377	1,333	1,177	1,221	1,297
Foreign	361	384	424	405	409	398
Unknown	46	50	34	21	39	42
Total	1,563	1,811	1,794	1,603	1,669	1,737

REPORT OF DEATHS FROM JULY 1, 1913, TO JANUARY 1, 1914, CLASSIFIED WITH REFERENCE TO SOCIAL RELATIONS.

Single	536	737	694	533	505	563
Married	659	667	668	655	740	721
Widowed	331	347	394	372	372	407
Divorced	16	23	13	21	23	21
Unknown	21	37	25	22	29	22
Total	1,563	1,811	1,794	1,603	1,669	1,737

*Stillbirths	65	73	51	71	77	81

*Stillbirths are not included in the foregoing classification of deaths.

TABLE NO. 4.

REPORT OF DEATHS FROM JANUARY 1, 1914, TO JULY 1, 1914, CLASSIFIED WITH REFERENCE TO DISEASES.

	January	February	March	April	May	June
Typhoid fever	21	11	10	10	10	12
Malarial fever		1				
Smallpox	1	1	2	1	3	
Measles	2	6	4	10	2	5
Scarlet fever	5	7	6	7	11	3
Whooping cough	8	4	8	14	10	12
Diphtheria and croup	18	8	18	16	17	13
Influenza	14	22	26	19	7	2
Erysipelas	1	5	10	12	12	2
Other epidemic diseases	1				1	
Septicaemia	14	18	12	25	20	10
Pellagra						1
Tetanus	8			3	1	5
Tuberculosis of lungs	102	114	110	120	106	83
Tuberculous meningitis	6	2	4	6	8	14
Pott's disease	1	1	1	1	2	1
Other forms of tuberculosis	13	12	7	17	8	8
Venereal diseases	4	1	2	4	5	1
Cancer and other malignant tumors	130	128	144	121	124	156
Acute articular rheumatism	5	5	7	16	7	6
Diabetes	33	28	39	30	23	26
Exophthalmic goitre		2	1	1	4	2
Leuchaemia	4	3	5	2	1	2
Anaemia, chlorosis	17	14	14	22	18	12
Other general diseases	10	11	7	18	6	11
Alcoholism	6	4	10	8	3	5
Simple meningitis	18	16	27	19	22	25
Cerebrospinal meningitis	2	2	7	3	3	3
Locomotor ataxia		4	1	2	3	1
Acute anterior poliomyelitis		2	3		1	2
Cerebral hemorrhage, apoplexy	167	124	130	157	133	125
Softening of the brain	4	2	2	3	7	5
Paralysis	30	28	30	31	32	19
General paralysis of insane	7	14	11	16	1	3
Other forms of mental alienation	4	4	7	2	1	4
Epilepsy	3	9	4	7	6	8
Convulsions (nonpuerperal)	2	1	2		2	1
Convulsions of infants	8	9	17	12	10	6
Chorea				1	1	4
Neuralgia and neuritis	3	3	2	2		
Other diseases of nervous system	16	13	31	22	21	16
Diseases of the ears		1	2	2		2
Acute endocarditis	12	12	11	14	8	9
Organic diseases of heart	189	178	194	178	181	169
Angina pectoris	13	12	13	15	8	4
Diseases of arteries, atheroma, aneurysm, etc.	41	36	58	44	49	32
Embolism and thrombosis	9	22	21	17	15	14
Hemorrhage; other diseases of circulatory system	8	6	4	7	4	7
Bronchitis	42	35	38	28	12	16
Bronchopneumonia	59	56	66	46	21	10
Pneumonia	237	251	200	225	117	41
Pulmonary congestion	18	23	23	15	15	12
Asthma	8	9	3	9	5	2
Other diseases of respiratory system	10	16	17	14	12	9
Ulcer of stomach	4	5	7	7	2	3
Other diseases of stomach	19	28	22	28	21	30
Diarrhoea and enteritis (under 2 years)	18	13	23	17	13	26
Diarrhoea and enteritis (2 years and more)	4	11	11	13	9	11
Appendicitis and typhlitis	21	30	28	30	19	26

TABLE NO. 4—Continued.

	January	February	March	April	May	June
Hernia and intestinal obstruction	30	23	19	26	22	21
Cirrhosis of liver	16	18	14	8	18	10
Other diseases of liver	14	10	23	18	15	13
Peritonitis	23	21	10	23	19	17
Other diseases of digestive system	6	15	15	13	22	7
Acute nephritis and Bright's disease	132	120	168	152	126	95
Other diseases of kidneys	11	4	10	6	4	5
Diseases of the bladder	11	5	6	8	11	4
Diseases of prostate	6	6	6	9	8	6
Noncancerous tumors and other diseases of female genital organ	4	6	8	9	10	3
Puerperal septicaemia	9	9	9	12	6	3
Other puerperal diseases	5	16	10	8	10	14
Gangrene	9	5	8	7	8	5
Other diseases of the skin and annexa	1	1	2		5	3
Diseases of bones and organs of locomotion	1		6	5	6	4
Malformations and injuries at birth	35	42	37	31	34	18
Premature birth	60	47	48	46	46	45
Congenital debility, atrophy, marasmus, etc.	42	23	40	26	22	24
Other causes peculiar to early infancy	7	6	19	18	15	8
Senility	88	88	80	75	70	58
Suicide	23	11	23	23	33	28
Poisoning by food, accident		2			1	
Other acute poisonings	4	1	5	7	1	7
Burns	13	11	9	9	11	4
Absorption of deleterious gases. Suffocation	5	7	2	1	6	1
Accidental drowning	3	1	1	3	10	29
Traumatism by firearms	6	6	3	6	5	3
Traumatism by cutting or piercing instruments	2					
Traumatism by fall	6	13	5	5	12	10
Traumatism in mines	3	3	9	1	2	2
Traumatism by machines	3		2	3	3	2
Traumatism by other crushing	3	2	3	1	1	1
Railroad accidents	13	14	19	12	18	16
Automobile accidents	5		2	6	7	11
Motorcycle accidents					1	1
Injuries by other vehicles	1	1	1	1	3	1
Injuries by animals	5	4	1	2	3	4
Starvation				1		
Excessive cold		1				
Effects of heat						7
Other external violence	4	4	4	7	2	6
Lightning				1	3	3
Electricity (except lightning)	3		3	1	1	5
Fractures	12	4	7	6	6	4
Homicide	5	1	4	2	2	4
Not specified or ill-defined	24	26	40	23	28	21
Total	2,052	1,960	2,222	2,087	1,800	1,570

REPORT OF DEATHS FROM JANUARY 1, 1914, TO JULY 1, 1914, CLASSIFIED WITH REFERENCE TO AGES.

Under 1 year	289	280	317	282	246	191
1 to 5 years	83	97	97	112	86	60
5 to 10 years	40	31	46	43	47	32
10 to 20 years	67	70	68	82	60	83
20 to 30 years	117	120	142	119	118	119
30 to 40 years	133	142	148	141	132	122
40 to 50 years	148	144	144	152	130	114
50 to 60 years	207	188	235	176	177	160
60 to 70 years	266	254	276	302	246	220
70 to 80 years	382	337	412	389	307	279
80 to 90 years	266	239	285	260	212	162
90 years and over	47	37	41	35	40	26
Unknown	17	11	12	4	1	4
Total	2,052	1,960	2,222	2,087	1,800	1,570

TABLE NO. 4—Continued.

REPORT OF DEATHS FROM JANUARY 1, 1914, TO JULY 1, 1914, CLASSIFIED WITH REFERENCE TO SEX.

	January	February	March	April	May	June
Male	1,103	1,040	1,200	1,153	1,020	866
Female	949	910	1,022	934	780	704
Total	2,052	1,950	2,222	2,087	1,800	1,570

REPORT OF DEATHS FROM JANUARY 1, 1914, TO JULY 1, 1914, CLASSIFIED WITH REFERENCE TO COLOR.

White	2,022	1,921	2,188	2,054	1,760	1,555
Colored	30	29	34	33	40	15
Total	2,052	1,950	2,222	2,087	1,800	1,570

REPORT OF DEATHS FROM JANUARY 1, 1914, TO JULY 1, 1914, CLASSIFIED WITH REFERENCE TO NATIVITY.

Native	1,524	1,484	1,668	1,562	1,347	1,182
Foreign	496	436	511	489	415	360
Unknown	32	30	43	36	38	28
Total	2,052	1,950	2,222	2,087	1,800	1,570

REPORT OF DEATHS FROM JANUARY 1, 1914, TO JULY 1, 1914, CLASSIFIED WITH REFERENCE TO SOCIAL RELATIONS.

Single	623	645	709	703	606	507
Married	838	836	917	845	738	660
Widowed	547	434	548	487	404	358
Divorced	24	25	17	21	25	20
Unknown	20	10	31	21	27	25
Total	2,052	1,950	2,222	2,087	1,800	1,570

*Stillbirths	67	79	75	65	61	59

*Stillbirths are not included in the foregoing classifications of deaths.

REPORT OF BIRTHS FOR CALENDAR YEAR 1912 AND MARRIAGES AND DIVORCES FOR FISCAL YEAR ENDING JUNE 30, 1913.

COUNTY	Stillbirths	Births (exclusive of stillbirths)	Marriages	Divorces
Adair	6	308	95	7
Adams	1	208	100	8
Allamakee	2	299	137	4
Appanoose		503	305	45
Audubon		259	101	7
Benton	7	442	190	21
Black Hawk	4	683	617	74
Boone	3	524	306	35
Bremer		316	182	11
Buchanan	5	337	191	13
Buena Vista	2	300	167	9
Butler	1	301	120	12
Calhoun	2	294	144	12
Carroll	2	359	203	6
Cass	5	324	182	24
Cedar	3	281	145	10
Cerro Gordo		270	291	46
Cherokee	3	294	156	8
Chickasaw		297	139	3
Clarke	1	182	89	5
Clay	1	250	130	10
Clayton	5	507	223	10
Clinton	3	492	530	46
Crawford	4	408	200	7
Dallas	4	481	203	24
Davis		212	132	18
Decatur	3	337	162	19
Delaware		344	165	8
Des Moines	1	523	466	54
Dickinson	3	140	76	4
Dubuque	5	648	573	25
Emmet		147	112	3
Fayette	3	462	242	10
Floyd	3	266	163	21
Franklin	3	319	141	8
Fremont	3	228	113	20
Greene	1	311	156	17
Grundy	6	322	110	3
Guthrie	6	325	133	10
Hamilton	6	400	165	12
Hancock		243	98	7
Hardin	1	359	164	7
Harrison	3	365	178	14
Henry		249	126	30
Howard	1	225	127	6
Humboldt	2	265	96	8
Ida		219	135	10
Iowa	2	363	162	3
Jackson	1	395	180	14
Jasper		422	236	16
Jefferson	3	253	162	13
Johnson	3	411	288	21
Jones	2	275	158	22
Keokuk	4	366	158	9
Kossuth	5	624	170	4
Lee	2	433	552	87
Linn	2	822	827	136
Louisa	2	219	74	13

REPORT OF BIRTHS FOR CALENDAR YEAR 1912 AND MARRIAGES AND DIVORCES FOR FISCAL YEAR ENDING JUNE 30, 1913—Continued.

COUNTY	Stillbirths	Births (exclusive of stillbirths)	Marriages	Divorces
Lucas		210	111	12
Lyon	5	359	117	5
Madison	4	265	108	8
Mahaska	1	449	298	57
Marion	3	373	184	18
Marshall	1	508	320	38
Mills	3	195	101	16
Mitchell	3	236	128	5
Monona	6	380	151	10
Monroe	9	523	263	31
Montgomery		239	187	17
Muscatine	4	824	298	63
O'Brien		369	131	5
Osceola	1	218	96	2
Page	2	360	199	30
Palo Alto	3	279	118	3
Plymouth	6	446	164	11
Pocahontas	4	321	107	7
Polk		1,674	1,812	480
Pottawattamie	8	619	1,106	124
Poweshiek	4	344	149	10
Ringgold		226	104	10
Sac	1	287	140	9
Scott	9	951	778	99
Shelby	2	363	136	7
Sioux		604	205	6
Story	2	368	193	5
Tama	1	354	185	13
Taylor	1	234	136	16
Union	4	196	184	30
Van Buren		245	131	10
Wapello		584	474	103
Warren		324	163	6
Washington	4	334	171	14
Wayne	8	317	149	17
Webster	5	637	426	31
Winnebago	6	305	102	5
Winneshiek	8	419	151	5
Woodbury	5	1,272	901	186
Worth	4	215	87	1
Wright	2	335	148	7
Total	269	37,372	23,007	2,641

REPORT OF BIRTHS FOR CALENDAR YEAR 1913 AND MARRIAGES AND DIVORCES FOR FISCAL YEAR ENDING JUNE 30, 1914.

COUNTY	Stillbirths	Births (exclusive of stillbirths)	Marriages	Divorces
Adair	1	280	94	2
Adams	1	188	83	8
Allamakee	3	317	119	5
Appanoose	9	535	314	58
Audubon	1	382	97	8
Benton	1	433	165	20
Black Hawk	1	716	601	125
Boone		834	310	40
Bremer	2	315	171	12
Buchanan	1	305	162	7
Buena Vista		276	146	6
Butler	2	284	137	11
Calhoun		270	163	6
Carroll	2	417	231	13
Cass	1	317	189	24
Cedar	4	302	100	16
Cerro Gordo	6	595	364	33
Chrokee	5	323	163	16
Chickasaw	4	290	140	10
Clarke	3	221	125	5
Clay	1	251	134	8
Clayton	4	470	217	11
Clinton	1	520	513	61
Crawford	7	417	201	17
Dallas	3	430	205	35
Davis	3	241	126	8
Decatur		283	167	10
Delaware	1	333	165	9
Des Moines		506	447	69
Dickinson	1	148	80	7
Dubuque	2	671	570	49
Emmet		234	119	3
Fayette	8	520	258	23
Floyd	1	349	165	18
Franklin	2	339	160	5
Fremont		270	80	21
Greene		302	149	15
Grundy	5	315	118	6
Guthrie	1	331	156	11
Hamilton	1	381	171	14
Hancock		274	109	7
Hardin	1	322	192	24
Harrison	3	411	203	36
Henry	2	242	135	18
Howard	2	263	108	10
Humboldt	5	256	99	7
Ida	1	207	102	10
Iowa		302	144	12
Jackson		271	156	7
Jasper	1	445	229	25
Jefferson	1	216	128	16
Johnson	5	397	269	37
Jones	4	335	176	18
Keokuk	2	350	148	24
Kossuth	6	403	183	13
Lee	2	478	536	69
Linn	3	711	933	160
Louisa	5	172	68	16

REPORT OF BIRTHS FOR CALENDAR YEAR 1913 AND MARRIAGES AND DIVORCES FOR FISCAL YEAR ENDING JUNE 30, 1914—Continued.

COUNTY	Stillbirths	Births (exclusive of stillbirths)	Marriages	Divorces
Lucas	3	193	126	14
Lyon	1	289	120	5
Madison	1	303	127	10
Mahaska	5	445	294	61
Marion		372	206	21
Marshall		554	325	44
Mills		158	97	20
Mitchell	2	264	119	6
Monona	3	346	169	17
Monroe	3	605	259	60
Montgomery		270	175	15
Muscatine	4	347	280	76
O'Brien		369	144	7
Osceola	5	251	93	5
Page	1	393	219	37
Palo Alto	5	299	108	7
Plymouth	1	509	178	10
Pocahontas		322	104	10
Polk	1	1,680	1,909	474
Pottawattamie	5	614	1,005	139
Poweshiek	1	316	151	16
Ringgold		254	103	8
Sac	4	283	128	6
Scott	6	1,005	822	117
Shelby	2	316	115	5
Sioux	7	625	245	6
Story	1	397	180	10
Tama	3	366	205	20
Taylor	3	251	124	19
Union	6	305	205	32
Van Buren	3	218	88	8
Wapello	2	518	463	81
Warren	4	315	160	7
Washington	3	200	146	18
Wayne	5	281	134	13
Webster	5	705	406	55
Winnebago	3	277	121	2
Winneshiek	6	1,230	1,056	160
Woodbury	5	320	162	4
Worth		205	65	4
Wright	5	355	175	10
Total	239	38,621	23,303	2,955

DEATHS FROM TUBERCULOSIS IN IOWA FOR THE YEARS 1912 AND 1913.

County	1912	1913	County	1912	1913
Adair	4	4	Johnson	14	18
Adams	2	2	Jones	12	12
Allamakee	8	4	Keokuk	9	14
Appanoose	19	16	Kossuth	7	8
Audubon	2	6	Lee	44	36
Benton	12	13	Linn	47	54
Black Hawk	29	35	Louisa	10	1
Boone	26	16	Lucas	8	5
Bremer	11	8	Lyon	4	3
Buchanan	35	34	Madison	4	13
Buena Vista	12	15	Mahaska	19	10
Butler	7	5	Marion	17	19
Calhoun	5	8	Marshall	21	10
Carroll	9	8	Mills	26	19
Cass	7	6	Mitchell	9	5
Cedar	6	6	Monona	7	5
Cerro Gordo	12	11	Monroe	20	21
Cherokee	16	16	Montgomery	6	7
Chickasaw	6	5	Muscatine	27	19
Clarke	4	7	O'Brien	9	5
Clay	8	2	Osceola	2	3
Clayton	14	10	Page	22	18
Clinton	33	29	Palo Alto	13	5
Crawford	5	4	Plymouth	5	8
Dallas	10	9	Pocahontas	2	4
Davis	9	18	Polk	115	107
Decatur	5	9	Pottawattamie	27	30
Delaware	8	8	Poweshiek	11	7
Des Moines	31	25	Ringgold	5	5
Dickinson	5	4	Sac	7	3
Dubuque	48	51	Scott	52	71
Emmet	2	7	Shelby	4	7
Fayette	11	6	Sioux	6	4
Floyd	5	7	Story	23	13
Franklin	3	3	Tama	14	10
Fremont	7	11	Taylor	9	10
Greene	9	5	Union	11	13
Grundy	6	4	Van Buren	12	8
Guthrie	14	9	Wapello	37	38
Hamilton	5	16	Warren	11	15
Hancock	5	7	Washington	9	10
Hardin	10	5	Wayne	14	11
Harrison	4	7	Webster	31	22
Henry	29	34	Winnebago	9	13
Howard	8	10	Winneshiek	27	16
Humboldt	3	1	Woodbury	43	57
Ida	5	4	Worth	6	5
Iowa	17	11	Wright	10	9
Jackson	13	13			
Jasper	22	11	Total	1,456	1,392
Jefferson	13	10			

DEATHS IN BURLINGTON, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	172	214
Females	146	162
Total	318	376
White	309	368
Colored	9	8
Total	318	376
Native	210	255
Foreign	103	110
Unknown	5	11
Total	318	376
Single	101	123
Married	120	158
Widowed	94	86
Divorced	1	4
Unknown	2	5
Total	318	376
Under 1 year	36	40
1 to 5 years	5	9
5 to 10 years	6	10
10 to 20 years	9	13
20 to 30 years	32	29
30 to 40 years	21	37
40 to 50 years	28	35
50 to 60 years	27	52
60 to 70 years	47	53
70 to 80 years	71	50
80 to 90 years	35	34
90 years and over	1	13
Unknown	0	1
Total	318	376
Typhoid fever	7	8
Whooping cough	0	5
Diphtheria	0	2
Influenza	3	1
Septicaemia	3	8
Tetanus	0	2
Tuberculosis of lungs	27	18
Tuberculous meningitis	0	1
Pott's disease	1	0
Other forms of tuberculosis	1	3
Cancer and other malignant tumors	25	16
Rheumatism	0	3
Diabetes	2	5
Exophthalmic goitre	1	0
Leukemia	0	1
Anaemia, chlorosis	6	4
Other general diseases	2	5
Alcoholism	0	3
Simple meningitis	1	6
Cerebrospinal meningitis	1	2
Cerebral hemorrhage, apoplexy	19	22
Softening of the brain	0	1
Paralysis	8	2
General paralysis of insane	1	0
Other forms of mental alienation	0	2
Epilepsy	1	0
Convulsions of infants	5	5

DEATHS IN BURLINGTON, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Chorea	1	0
Other diseases of nervous system	2	5
Diseases of the ears	1	0
Acute endocarditis	3	5
Organic diseases of heart	27	31
Angina pectoris	2	3
Diseases of arteries, atheroma, aneurysm, etc.	10	14
Embolism and thrombosis	1	3
Hemorrhage; other diseases of circulatory system	2	0
Bronchitis	4	7
Broncho-pneumonia	4	1
Pneumonia	16	20
Pulmonary congestion	3	2
Asthma	4	5
Other diseases of respiratory system	2	2
Ulcer of stomach	1	1
Other diseases of stomach	5	4
Diarrhoea and enteritis (under 2 years)	3	5
Diarrhoea and enteritis (2 years and more)	3	2
Appendicitis and typhlitis	4	7
Hernia and intestinal obstruction	3	10
Cirrhosis of liver	3	2
Other diseases of liver	4	3
Peritonitis	2	1
Other diseases of digestive system	1	1
Acute nephritis and Bright's disease	28	22
Other diseases of kidneys	1	2
Diseases of the bladder	1	2
Puerperal septicaemia	1	1
Other puerperal diseases	0	1
Gangrene	1	3
Malformations and injuries at birth	3	4
Premature birth	8	6
Congenital debility, atrophy, marasmus, etc.	8	16
Senility	13	17
Suicide	8	9
Acute poisonings	0	1
Absorption of deleterious gases. Suffocation	1	5
Accidental drowning	1	5
Traumatism by firearms	1	1
Traumatism by fall	0	3
Traumatism by machines	0	1
Railroad accidents	3	2
Automobile accidents	0	1
Injuries by animals	1	2
Effects of heat	2	4
Other external violence	0	2
Lightning	1	0
Fractures	5	3
Homicide	1	2
Not specified or ill-defined	5	5
Total	318	376
Stillbirths	24	11

DEATHS IN CEDAR RAPIDS, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	247	327
Females	169	245
Total	416	572
White	404	564
Colored	12	8
Total	416	572
Native	312	437
Foreign	97	124
Unknown	7	11
Total	416	572
Single	155	230
Married	173	240
Widowed	883	96
Divorced	1	4
Unknown	4	2
Total	416	572
Under 1 year	71	91
1 to 5 years	14	44
5 to 10 years	4	17
10 to 20 years	29	26
20 to 30 years	33	45
30 to 40 years	51	57
40 to 50 years	30	50
50 to 60 years	51	51
60 to 70 years	46	84
70 to 80 years	50	65
80 to 90 years	31	32
90 years and over	6	8
Unknown	0	2
Total	416	572
Typhoid fever	13	11
Measles	0	4
Scarlet fever	0	5
Whooping cough	0	4
Diphtheria and croup	0	7
Influenza	3	6
Erysipelas	1	1
Other epidemic diseases	0	1
Septicaemia	5	3
Tetanus	1	0
Tuberculosis of lungs	29	32
Tuberculous meningitis	1	4
Pott's disease	1	0
Other forms of tuberculosis	3	1
Veneral diseases	0	1
Cancer and other malignant tumors	26	33
Rheumatism	0	1
Diabetes	4	7
Anaemia, chlorosis	3	9
Other general diseases	1	2
Alcoholism	2	4
Simple meningitis	7	10
Cerebrospinal meningitis	5	7
Locomotor ataxia	1	1
Acute anterior poliomyelitis	1	3
Cerebral hemorrhage, apoplexy	25	44
Softening of the brain	2	1

DEATHS IN CEDAR RAPIDS, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Paralysis	4	5
General paralysis of the insane	1	0
Other forms of mental alienation	0	1
Epilepsy	1	0
Convulsions (nonpuerperal)	1	1
Convulsions of infants	8	10
Other diseases of nervous system	0	6
Acute endocarditis	1	9
Organic diseases of heart	24	33
Angina pectoris	6	5
Diseases of arteries, atheroma, aneurysm, etc.	7	8
Embolism and thrombosis	6	5
Hemorrhage; other diseases of circulatory system	2	3
Bronchitis	4	9
Broncho-pneumonia	3	14
Pneumonia	24	44
Pulmonary congestion	2	2
Asthma	3	0
Other diseases of respiratory system	1	3
Ulcer of stomach	1	2
Other diseases of stomach	7	10
Diarrhoea and enteritis (under 2 years)	12	10
Diarrhoea and enteritis (2 years and more)	0	2
Appendicitis and typhlitis	11	7
Hernia and intestinal obstruction	6	5
Cirrhosis of liver	5	5
Other diseases of liver	9	6
Peritonitis	6	4
Other diseases of digestive system	1	3
Acute nephritis and Bright's disease	26	20
Other diseases of kidneys	1	6
Diseases of the bladder	4	0
Diseases of prostate	0	3
Noncancerous tumors and other diseases female genital organs	1	2
Puerperal septicaemia	2	2
Other puerperal diseases	4	1
Gangrene	4	1
Other diseases of the skin and annexa	1	1
Diseases of bones and organs of locomotion	0	1
Malformations and injuries at birth	5	6
Premature birth	14	12
Congenital debility, atrophy, marasmus, etc.	14	18
Other causes peculiar to early infancy	1	2
Senility	9	9
Suicide	8	7
Acute poisonings	0	3
Burns	2	5
Absorption of deleterious gases. Suffocation	0	4
Accidental drowning	5	8
Traumatism by firearms	0	1
Traumatism by fall	3	5
Traumatism by machines	0	1
Traumatism by other crushing	1	1
Railroad accidents	11	14
Street car accidents	0	1
Injuries by other vehicles	0	1
Injuries by animals	0	1
Excessive cold	1	0
Effects of heat	0	3
Other external violence	1	7
Fractures	2	2
Homicide	3	2
Not specified or ill-defined	3	8
Total	416	572
Stillbirths	27	23

DEATHS IN CLINTON, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	117	150
Females	106	127
Total	223	277
White	216	273
Colored	7	4
Total	223	277
Native	151	167
Foreign	71	98
Unknown	1	12
Total	223	277
Single	70	89
Married	88	104
Widowed	59	65
Divorced	2	5
Unknown	4	14
Total	223	277
Under 1 year	27	24
1 to 5 years	6	6
5 to 10 years	6	6
10 to 20 years	8	9
20 to 30 years	16	28
30 to 40 years	15	18
40 to 50 years	17	23
50 to 60 years	31	36
60 to 70 years	37	40
70 to 80 years	37	57
80 to 90 years	19	21
90 years and over	2	5
Unknown	2	4
Total	223	277
Typhoid fever	5	4
Whooping cough	2	0
Diphtheria and croup	0	1
Influenza	0	1
Erysipelas	1	0
Septicaemia	1	0
Tuberculosis of lungs	15	16
Tuberculous meningitis	2	3
Other forms of tuberculosis	1	1
Venereal diseases	1	0
Cancer and other malignant tumors	21	16
Rheumatism	1	3
Diabetes	2	5
Anaemia, chlorosis	4	5
Other general diseases	0	4
Alcoholism	0	3
Simple meningitis	0	2
Cerebro-spinal meningitis	2	1
Locomotor ataxia	0	1
Cerebral hemorrhage, apoplexy	14	22
Paralysis	2	5
General paralysis of insane	1	1
Other forms of mental alienation	0	1
Epilepsy	0	1
Convulsions (nonpuerperal)	0	1
Convulsions of infants	2	4
Other diseases of nervous system	0	1

DEATHS IN CLINTON, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Acute endocarditis	2	3
Organic diseases of heart	21	28
Angina pectoris	3	0
Diseases of arteries, atheroma, aneurysm, etc.	6	4
Embolism and thrombosis	4	1
Hemorrhage; other diseases of circulatory system	0	2
Bronchitis	5	8
Broncho-pneumonia	3	5
Pneumonia	14	21
Pulmonary congestion	1	1
Asthma	3	2
Ulcer of stomach	0	4
Other diseases of stomach	1	0
Diarrhoea and enteritis (under 2 years)	4	2
Diarrhoea and enteritis (2 years and more)	1	2
Appendicitis and typhlitis	3	4
Hernia and instestinal obstruction	4	2
Cirrhosis of liver	4	4
Other diseases of liver	1	2
Peritonitis	4	3
Acute nephritis and Bright's disease	18	24
Other diseases of kidneys	0	1
Diseases of the bladder	1	3
Puerperal septicaemia	0	1
Other puerperal diseases	1	1
Gangrene	0	2
Other diseases of the skin and annexa	1	0
Malformations and injuries at birth	3	5
Premature birth	5	3
Congenital debility, atrophy, marasmus, etc.	3	7
Other causes peculiar to early infancy	2	5
Senility	8	3
Suicide	2	4
Accidental drowning	2	3
Traumatism by firearms	0	1
Traumatism by fall	4	5
Traumatism by machines	1	1
Traumatism by other crushing	1	0
Railroad accidents	6	9
Other external violence	0	1
Fractures	1	0
Homicide	1	1
Not specified or ill-defined	2	1
Total	223	277
Stillbirths	8	13

DEATHS IN COUNCIL BLUFFS, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	217	280
Females	188	225
Total	405	505
White	399	492
Colored	6	13
Total	405	505
Native	313	395
Foreign	78	109
Unknown	14	31
Total	405	505
Single	159	200
Married	153	186
Widowed	83	102
Divorced	6	4
Unknown	4	13
Total	405	505
Under 1 year	67	78
1 to 5 years	21	21
5 to 10 years	9	15
10 to 20 years	24	28
20 to 30 years	32	42
30 to 40 years	33	59
40 to 50 years	36	54
50 to 60 years	44	37
60 to 70 years	53	62
70 to 80 years	48	64
80 to 90 years	37	41
90 years and over	1	3
Unknown	0	1
Total	405	505
Typhoid fever	4	8
Smallpox	1	0
Measles	0	2
Scarlet fever	3	2
Whooping cough	2	0
Diphtheria and croup	10	9
Erysipelas	2	1
Septicaemia	2	12
Tetanus	1	0
Tuberculosis of lungs	17	25
Tuberculous meningitis	2	1
Other forms of tuberculosis	3	9
Venereal diseases	3	1
Cancer and other malignant tumors	29	37
Rheumatism	0	1
Diabetes	4	0
Exophthalmic goitre	1	0
Leukemia	1	1
Anaemia, chlorosis	1	3
Other general diseases	5	9
Alcoholism	2	3
Simple meningitis	3	4
Cerebrospinal meningitis	1	4
Locomotor ataxia	0	1
Cerebral hemorrhage, apoplexy	25	22
Softening of the brain	1	1
Paralysis	6	3

DEATHS IN COUNCIL BLUFFS, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
General paralysis of insane	0	4
Epilepsy	2	4
Convulsions of infants	1	2
Other diseases of nervous system	2	5
Acute endocarditis	4	2
Organic diseases of heart	29	43
Angina pectoris	0	2
Diseases of arteries, atheroma, aneurysm, etc.	8	14
Embolism and thrombosis	3	10
Hemorrhage; other diseases of circulatory system	3	0
Bronchitis	2	5
Bronchopneumonia	2	8
Pneumonia	26	34
Pulmonary congestion	3	6
Asthma	1	0
Other diseases of respiratory system	2	2
Ulcer of stomach	1	4
Other diseases of stomach	6	5
Diarrhoea and enteritis (under 2 years)	8	18
Diarrhoea and enteritis (2 years and more)	6	6
Appendicitis and typhlitis	6	6
Hernia and intestinal obstruction	6	3
Cirrhosis of liver	9	4
Other diseases of liver	4	9
Peritonitis	10	5
Other diseases of digestive system	0	1
Acute nephritis and Bright's disease	29	24
Diseases of the bladder	0	3
Diseases of prostate	3	7
Noncancerous tumors and other diseases of female genital organs	1	0
Puerperal septicaemia	4	2
Other puerperal diseases	1	4
Gangrene	1	0
Malformations and injuries at birth	5	7
Premature birth	21	16
Congenital debility, atrophy, marasmus, etc.	2	6
Other causes peculiar to early infancy	3	3
Senility	17	9
Suicide	4	6
Acute poisonings	1	3
Burns	5	1
Absorption of deleterious gases. Suffocation	5	4
Accidental drowning	0	1
Traumatism by firearms	3	1
Traumatism by fall	1	6
Traumatism by other crushing	0	1
Railroad accidents	9	16
Street car accidents	1	1
Automobile accidents	1	2
Injuries by other vehicles	2	0
Injuries by animals	0	1
Starvation	2	0
Effects of heat	0	2
Other external violence	1	9
Electricity (except lightning)	1	2
Fractures	3	0
Homicide	2	2
Not specified or ill-defined	4	9
Total	405	505
Stillbirths	22	19

DEATHS IN DAVENPORT, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	373	374
Females	274	287
Total	647	661
White	631	651
Colored	16	10
Total	647	661
Native	409	424
Foreign	227	218
Unknown	11	19
Total	647	661
Single	226	230
Married	245	230
Widowed	162	166
Divorced	10	6
Unknown	14	19
Total	647	661
Under 1 year	78	90
1 to 5 years	22	41
5 to 10 years	10	11
10 to 20 years	28	18
20 to 30 years	38	46
30 to 40 years	63	55
40 to 50 years	77	59
50 to 60 years	86	81
60 to 70 years	86	91
70 to 80 years	79	83
80 to 90 years	66	79
90 years and over	14	5
Unknown	0	2
Total	647	661
Typhoid fever	5	1
Measles	4	3
Scarlet fever	1	3
Whooping cough	2	6
Diphtheria and croup	6	4
Influenza	2	4
Erysipelas	2	2
Septicaemia	7	5
Tetanus	1	1
Tuberculosis of lungs	41	55
Tuberculous meningitis	2	5
Other forms of tuberculosis	7	8
Venereal diseases	2	1
Cancer and other malignant tumors	48	38
Rheumatism	6	0
Diabetes	5	6
Exophthalmic goitre	1	1
Leukemia	1	0
Anaemia, chlorosis	7	3
Other general diseases	5	3
Alcoholism	10	4
Simple meningitis	7	5
Cerebrospinal meningitis	1	0
Locomotor ataxia	2	0
Acute anterior poliomyelitis	2	1
Cerebral hemorrhage, apoplexy	47	50
Softening of the brain	1	0

DEATHS IN DAVENPORT, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Paralysis	4	4
General paralysis of insane	0	3
Other forms of mental alienation	2	2
Epilepsy	1	1
Convulsions (nonpuerperal)	0	1
Convulsions of infants	6	0
Neuralgia and neuritis	0	1
Other diseases of nervous system	2	11
Diseases of the ears	3	0
Acute endocarditis	9	4
Organic diseases of heart	62	54
Angina pectoris	3	4
Diseases of arteries, atheroma, aneurysm, etc.	23	20
Embolism and thrombosis	2	7
Hemorrhage; other diseases of circulatory system	4	1
Bronchitis	11	9
Bronchopneumonia	14	11
Pneumonia	54	76
Pulmonary congestion	5	6
Asthma	1	0
Other diseases of respiratory system	1	3
Ulcer of stomach	4	1
Other diseases of stomach	3	9
Diarrhoea and enteritis (under 2 years)	6	25
Diarrhoea and enteritis (2 years and more)	2	4
Appendicitis and typhlitis	7	4
Hernia and intestinal obstruction	14	5
Cirrhosis of liver	14	7
Other diseases of liver	7	7
Peritonitis	9	1
Other diseases of digestive system	2	2
Acute nephritis and Bright's disease	28	43
Other diseases of kidneys	0	3
Diseases of the bladder	3	1
Diseases of prostate	5	2
Noncancerous tumors and other diseases of female genital organs	3	0
Puerperal septicaemia	3	1
Other puerperal diseases	3	1
Gangrene	6	1
Other diseases of the skin and annexa	1	0
Malformations and injuries at birth	11	6
Premature birth	23	29
Congenital debility, atrophy, marasmus, etc.	6	11
Other causes peculiar to early infancy	3	3
Senility	21	15
Suicide	11	14
Acute poisonings	1	0
Burns	3	0
Absorption of deleterious gases. Suffocation	1	3
Accidental drowning	0	5
Traumatism by firearms	0	1
Traumatism by fall	1	4
Traumatism by other crushing	6	2
Railroad accidents	7	10
Automobile accidents	0	4
Motorcycle accidents	1	0
Excessive cold	1	0
Effects of heat	3	3
Other external violence	0	2
Fractures	3	0
Homicide	2	2
Not specified or ill-defined	4	4
Total	647	661
Stillbirths	29	31

DEATHS IN DES MOINES, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	705	732
Females	514	596
Total	1,219	1,328
White	1,152	1,254
Colored	67	74
Total	1,219	1,328
Native	982	1,093
Foreign	197	206
Unknown	40	29
Total	1,219	1,328
Single	429	468
Married	508	581
Widowed	218	230
Divorced	34	21
Unknown	30	28
Total	1,219	1,328
Under 1 year	175	190
1 to 5 years	61	82
5 to 10 years	19	16
10 to 20 years	52	45
20 to 30 years	109	104
30 to 40 years	120	132
40 to 50 years	117	151
50 to 60 years	147	168
60 to 70 years	183	169
70 to 80 years	141	156
80 to 90 years	73	92
90 years and over	14	16
Unknown	8	7
Total	1,219	1,328
Typhoid fever	10	13
Smallpox	0	1
Measles	0	8
Scarlet fever	7	4
Whooping cough	7	3
Diphtheria and croup	19	13
Influenza	1	5
Erysipelas	4	4
Septicaemia	14	19
Tetanus	1	1
Tuberculosis of lungs	78	80
Tuberculous meningitis	2	8
Pott's disease	1	0
Other forms of tuberculosis	13	6
Venereal diseases	3	3
Cancer and other malignant tumors	89	103
Rheumatism	5	4
Diabetes	12	10
Exophthalmic goitre	4	0
Leukemia	2	3
Anaemia, chlorosis	12	11
Other general diseases	6	5
Alcoholism	11	6
Chronic occupation poisonings	1	0
Simple meningitis	9	9
Cerebrospinal meningitis	5	1
Locomotor ataxia	3	1
Cerebral hemorrhage, apoplexy	60	54
Softening of the brain	1	0

DEATHS IN DES MOINES, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Paralysis	18	12
General paralysis of insane	1	5
Other forms of mental alienation	2	2
Epilepsy	4	7
Convulsions of infants	4	3
Chorea	1	0
Neuralgia and neuritis	2	0
Other diseases of nervous system	11	8
Diseases of the ears	2	0
Acute endocarditis	21	14
Organic diseases of heart	111	102
Angina pectoris	7	9
Diseases of arteries, atheroma, aneurysm, etc.	17	29
Embolism and thrombosis	7	13
Hemorrhage; other diseases of circulatory system	6	5
Bronchitis	12	12
Bronchopneumonia	17	21
Pneumonia	110	109
Pulmonary congestion	4	7
Asthma	8	3
Other diseases of respiratory system	2	14
Ulcer of stomach	7	7
Other diseases of stomach	9	14
Diarrhoea and enteritis (under 2 years)	26	35
Diarrhoea and enteritis (2 years and more)	4	9
Appendicitis and typhlitis	9	16
Hernia and intestinal obstruction	27	25
Cirrhosis of liver	7	15
Other diseases of liver	15	17
Peritonitis	10	15
Other diseases of digestive system	1	3
Acute nephritis and Bright's disease	67	87
Other diseases of kidneys	9	4
Diseases of the bladder	4	4
Diseases of prostate	6	2
Noncancerous tumors and other diseases of female genital organs	7	6
Puerperal septicaemia	2	3
Other puerperal diseases	9	7
Gangrene	3	5
Other diseases of the skin and annexa	1	1
Diseases of bones and organs of locomotion	1	1
Malformations and injuries at birth	13	18
Premature birth	46	47
Congenital debility, atrophy, marasmus, etc.	22	35
Other causes peculiar to early infancy	4	7
Senility	37	41
Suicide	26	19
Acute poisonings	0	2
Burns	11	10
Absorption of deleterious gases. Suffocation	7	9
Accidental drowning	11	7
Traumatism by firearms	1	2
Traumatism by fall	10	16
Traumatism in mines	3	5
Traumatism by machines	0	1
Traumatism by other crushing	1	4
Railroad accidents	15	17
Street car accidents	3	8
Automobile accidents	4	8
Injuries by other vehicles	1	5
Injuries by animals	2	0
Effects of heat	1	2
Other external violence	5	4
Electricity (except lightning)	0	2
Fractures	9	4
Homicide	13	9
Not specified or ill-defined	10	20
Total	1,219	1,328
Stillbirths	52	55

DEATHS IN DUBUQUE, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	261	281
Females	237	221
Total	498	502
White	497	499
Colored	1	3
Total	498	502
Native	322	348
Foreign	163	144
Unknown	13	10
Total	498	502
Single	174	229
Married	196	156
Widowed	114	105
Divorced	6	2
Unknown	8	10
Total	498	502
Under 1 year	53	60
1 to 5 years	12	36
5 to 10 years	4	15
10 to 20 years	25	21
20 to 30 years	38	41
30 to 40 years	37	41
40 to 50 years	51	56
50 to 60 years	64	48
60 to 70 years	68	62
70 to 80 years	88	63
80 to 90 years	50	50
90 years and over	5	9
Unknown	3	0
Total	498	502
Typhoid fever	9	6
Malarial fever	1	0
Measles	0	4
Scarlet fever	2	13
Whooping cough	2	0
Diphtheria and croup	6	5
Influenza	2	3
Erysipelas	2	3
Septicaemia	2	4
Tuberculosis of lungs	37	36
Tuberculous meningitis	1	4
Other forms of tuberculosis	6	2
Venereal diseases	2	0
Cancer and other malignant tumors	28	26
Rheumatism	3	3
Diabetes	2	7
Exophthalmic goitre	1	0
Leukemia	1	0
Anaemia, chlorosis	2	3
Other general diseases	3	2
Alcoholism	1	3
Simple meningitis	5	14
Cerebrospinal meningitis	1	2
Locomotor ataxia	0	1
Acute anterior poliomyelitis	0	2
Softening of the brain	45	41
Paralysis	1	2

DEATHS IN DUBUQUE, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
General paralysis of insane	13	6
Other forms of mental alienation	4	2
Epilepsy	2	2
Convulsions (nonpuerperal)	1	4
Convulsions of infants	0	2
Chorea	10	4
Other diseases of nervous system	1	0
Acute endocarditis	3	9
Organic diseases of heart	4	2
Angina pectoris	52	45
Diseases of arteries, atheroma, aneurysm, etc.	2	2
Embolism and thrombosis	11	4
Hemorrhage; other diseases of circulatory system	2	4
Bronchitis	2	1
Bronchopneumonia	4	9
Pneumonia	5	4
Pulmonary congestion	23	26
Asthma	1	3
Other diseases of respiratory system	4	0
Ulcer of stomach	1	1
Other diseases of stomach	2	2
Diarrhoea and enteritis (under 2 years)	5	3
Diarrhoea and enteritis (2 years and more)	4	16
Appendicitis and typhlitis	1	8
Hernia and intestinal obstruction	5	4
Cirrhosis of liver	12	7
Other diseases of liver	7	2
Peritonitis	2	1
Other diseases of digestive system	8	6
Acute nephritis and Bright's disease	2	3
Other diseases of kidneys	38	43
Diseases of the bladder	0	3
Diseases of prostate	3	1
Noncancerous tumors and other diseases female genital organs	1	1
Puerperal septicaemia	1	0
Other puerperal diseases	1	1
Gangrene	3	1
Other diseases of the skin and annexa	2	2
Diseases of bones and organs of locomotion	0	2
Malformations and injuries at birth	1	1
Premature birth	2	6
Congenital debility, atrophy, marasmus, etc.	9	15
Other causes peculiar to early infancy	10	3
Senility	7	2
Suicide	27	19
Acute poisonings	5	6
Burns	0	1
Absorption of deleterious gases. Suffocation	2	6
Accidental drowning	3	1
Traumatism by fall	6	2
Traumatism by machines	3	0
Traumatism by other crushing	2	1
Railroad accidents	1	0
Street car accidents	4	7
Automobile accidents	0	1
Injuries by other vehicles	0	2
Injuries by animals	1	0
Effects of heat	1	0
Other external violence	3	1
Electricity (except lightning)	0	1
Fractures	3	0
Homicide	0	1
Not specified or ill-defined	2	3
Total	498	502
Stillbirths	7	15

DEATHS IN FORT DODGE, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	76	103
Females	60	93
Total	136	196
White	134	195
Colored	2	1
Total	136	196
Native	94	137
Foreign	39	57
Unknown	3	2
Total	136	196
Single	46	82
Married	50	71
Widowed	35	42
Divorced	3	1
Unknown	2	0
Total	136	196
Under 1 year	13	23
1 to 5 years	7	16
5 to 10 years	1	6
10 to 20 years	8	7
20 to 30 years	11	19
30 to 40 years	13	15
40 to 50 years	20	12
50 to 60 years	11	22
60 to 70 years	19	31
70 to 80 years	18	23
80 to 90 years	13	19
90 years and over	0	3
Unknown	2	0
Total	136	196
Typhoid fever	5	5
Measles	0	4
Whooping cough	0	1
Diphtheria and croup	1	3
Erysipelas	0	1
Septicaemia	2	1
Tetanus	1	1
Tuberculosis of lungs	16	11
Other forms of tuberculosis	0	2
Venereal diseases	0	3
Cancer and other malignant tumors	12	11
Rheumatism	1	1
Diabetes	0	3
Exophthalmic goitre	0	1
Anaemia, chlorosis	1	1
Other general diseases	2	3
Alcoholism	0	1
Simple meningitis	1	3
Cerebrospinal meningitis	1	1
Cerebral hemorrhage, apoplexy	7	18
Paralysis	1	0
Convulsions of infants	0	1
Neuralgia and neuritis	0	1
Other diseases of nervous system	1	2
Organic diseases of heart	11	17
Diseases of arteries, atheroma, aneurysm, etc.	1	4
Hemorrhage; other diseases of circulatory system	2	0

DEATHS IN FORT DODGE, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Bronchopneumonia	2	6
Pneumonia	12	26
Pulmonary congestion	1	2
Other diseases of respiratory system	0	1
Diseases of stomach (except ulcer of stomach)	2	1
Diarrhoea and enteritis (under 2 years)	2	3
Diarrhoea and enteritis (2 years and more)	1	6
Appendicitis and typhlitis	3	1
Hernia and intestinal obstruction	3	3
Cirrhosis of liver	0	2
Other diseases of liver	0	2
Peritonitis	1	3
Other diseases of digestive system	0	2
Acute nephritis and Bright's disease	4	11
Diseases of prostate	1	0
Puerperal speticaemia	0	1
Other Puerperal diseases	3	1
Diseases of bones and organs of locomotion	1	0
Malformations and injuries at birth	0	1
Premature birth	1	1
Congenital debility, atrophy, marasmus, etc.	4	1
Other causes peculiar to early infancy	2	0
Senility	8	4
Suicide	2	3
Burns	1	1
Absorption of deleterious gases. Suffocation	0	1
Accidental drowning	0	1
Traumatism by fall	3	0
Traumatism in mines	0	1
Traumatism by other crushing	1	1
Railroad accidents	2	5
Automobile accidents	1	2
Injuries by animals	1	0
Other external violence	0	2
Electricity (except lightning)	1	0
Homicide	2	0
Not specified or ill-defined	5	1
Total	136	196
Stillbirths	1	3

DEATHS IN KEOKUK, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	127	147
Females	92	151
Total	219	298
White	203	260
Colored	16	38
Total	219	298
Native	154	223
Foreign	46	48
Unknown	19	17
Total	219	298
Single	89	112
Married	73	110
Widowed	48	68
Divorced	2	5
Unknown	7	13
Total	219	298
Under 1 year	27	27
1 to 5 years	14	21
5 to 10 years	8	3
10 to 20 years	9	22
20 to 30 years	21	31
30 to 40 years	19	30
40 to 50 years	19	26
50 to 60 years	25	28
60 to 70 years	22	40
70 to 80 years	27	27
80 to 90 years	24	37
90 years and over	2	6
Unknown	3	0
Total	219	298
Typhoid fever	6	12
Measles	0	4
Scarlet fever	0	1
Whooping cough	1	2
Diphtheria and croup	3	2
Influenza	1	3
Erysipelas	0	4
Septicaemia	2	1
Tetanus	0	2
Tuberculosis of lungs	16	18
Tuberculous meningitis	1	0
Other forms of tuberculosis	6	2
Venereal diseases	2	0
Cancer and other malignant tumors	6	22
Rheumatism	2	1
Diabetes	1	2
Exophthalmic goitre	0	2
Leukemia	0	1
Other general diseases	1	0
Alcoholism	0	3
Simple meningitis	0	5
Cerebrospinal meningitis	0	4
Acute anterior poliomyelitis	3	0
Cerebral hemorrhage, apoplexy	9	22
Softening of the brain	1	0
Paralysis	8	9
General paralysis of insane	0	1

DEATHS IN KEOKUK, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Convulsions of infants	0	1
Other diseases of nervous system	2	3
Acute endocarditis	1	0
Organic diseases of heart	16	23
Angina pectoris	0	2
Diseases of arteries, atheroma, aneurysm, etc.	3	2
Embolism and thrombosis	1	1
Hemorrhage; other diseases of circulatory system	1	1
Bronchitis	6	2
Bronchopneumonia	0	2
Pneumonia	22	22
Pulmonary congestion	0	1
Asthma	1	1
Other diseases of respiratory system	3	3
Diseases of stomach (except ulcer of stomach)	4	6
Diarrhoea and enteritis (under 2 years)	6	1
Diarrhoea and enteritis (2 years and more)	2	1
Appendicitis and typhlitis	1	5
Hernia and intestinal obstruction	2	3
Cirrhosis of liver	5	1
Other diseases of liver	1	7
Peritonitis	3	3
Other diseases of digestive system	2	0
Acute nephritis and Bright's disease	13	16
Diseases of prostate	1	0
Noncancerous tumors and other diseases female genital organs	1	0
Puerperal septicaemia	2	1
Gangrene	1	0
Malformations and injuries at birth	2	0
Premature birth	4	4
Congenital debility, atrophy, marasmus, etc.	7	4
Other causes peculiar to early infancy	0	1
Senility	19	13
Suicide	2	6
Burns	0	3
Absorption of deleterious gases. Suffocation	0	1
Accidental drowning	1	2
Traumatism by fall	4	5
Traumatism by other crushing	1	0
Railroad accidents	1	2
Injuries by other vehicles	1	2
Other external violence	0	1
Electricity (except lightning)	0	1
Fractures	2	1
Homicide	3	2
Not specified or ill-defined	3	2
Total	219	298
Stillbirths	6	9

DEATHS IN MARSHALLTOWN, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	146	168
Females	74	124
Total	220	292
White	220	288
Colored	0	4
Total	220	292
Native	186	232
Foreign	31	48
Unknown	3	12
Total	220	292
Single	56	68
Married	93	103
Widowed	65	103
Divorced	3	7
Unknown	3	11
Total	220	292
Under 1 year	15	27
1 to 5 years	10	12
5 to 10 years	4	4
10 to 20 years	4	5
20 to 30 years	6	15
30 to 40 years	9	16
40 to 50 years	15	18
50 to 60 years	15	14
60 to 70 years	52	47
70 to 80 years	55	83
80 to 90 years	29	41
90 years and over	5	7
Unknown	1	3
Total	220	292
Typhoid fever	1	1
Scarlet fever	1	0
Diphtheria and croup	0	1
Influenza	3	5
Erysipelas	0	2
Septicaemia	1	6
Tetanus	1	1
Tuberculosis of lungs	8	4
Pott's disease	0	1
Other forms of tuberculosis	2	1
Venereal diseases	0	2
Cancer and other malignant tumors	20	22
Rheumatism	2	1
Diabetes	1	4
Leukemia	1	0
Anaemia, chlorosis	3	1
Other general diseases	3	4
Simple meningitis	1	1
Cerebrospinal meningitis	1	0
Locomotor ataxia	2	0
Cerebral hemorrhage, apoplexy	16	24
Softening of the brain	1	1
Paralysis	10	16
General paralysis of insane	1	0
Convulsions of infants	0	0
Other diseases of nervous system	0	3
Diseases of ears	1	0

DEATHS IN MARSHALLTOWN, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Acute endocarditis	3	1
Organic diseases of heart	26	36
Angina pectoris	1	2
Diseases of arteries, atheroma, aneurysm, etc.	1	4
Embolism and thrombosis	2	1
Hemorrhage; other diseases of circulatory system	3	1
Bronchitis	1	4
Bronchopneumonia	2	2
Pneumonia	15	22
Pulmonary congestion	1	3
Other diseases of respiratory system	2	1
Diseases of stomach (except ulcer of stomach)	2	5
Diarrhoea and enteritis (under 2 years)	2	5
Diarrhoea and enteritis (2 years and more)	4	7
Appendicitis and typhlitis	2	0
Hernia and intestinal obstruction	6	2
Cirrhosis of liver	3	8
Other diseases of liver	1	3
Peritonitis	3	3
Other diseases of digestive system	2	2
Acute nephritis and Bright's disease	17	19
Diseases of the bladder	3	1
Diseases of prostate	2	1
Noncancerous tumors and other diseases female genital organs	0	2
Puerperal septicaemia	0	1
Other puerperal diseases	2	1
Gangrene	2	3
Diseases of bones and organs of locomotion	1	0
Malformations and injuries at birth	5	6
Premature birth	3	8
Congenital debility, atrophy, marasmus, etc.	1	5
Other causes peculiar to early infancy	1	0
Senility	12	15
Suicide	0	2
Absorption of deleterious gases. Suffocation	0	1
Accidental drowning	1	2
Traumatism by fall	2	1
Railroad accidents	2	6
Excessive cold	0	1
Other external violence	0	1
Fractures	2	0
Homicide	1	1
Not specified or ill-defined	1	2
Total	220	292
Stillbirths	3	9

DEATHS IN MUSCATINE, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	117	115
Females	109	101
Total	226	216
White	224	213
Colored	2	3
Total	226	216
Native	164	156
Foreign	56	57
Unknown	6	3
Total	226	216
Single	73	75
Married	83	76
Widowed	65	60
Divorced	3	3
Unknown	2	2
Total	226	216
Under 1 year	37	23
1 to 5 years	9	16
5 to 10 years	5	2
10 to 20 years	6	9
20 to 30 years	15	18
30 to 40 years	14	14
40 to 50 years	15	14
50 to 60 years	24	13
60 to 70 years	29	26
70 to 80 years	38	39
80 to 90 years	27	35
90 years and over	7	1
Unknown	0	1
Total	226	216
Typhoid fever	3	4
Malarial fever	0	1
Measles	0	1
Whooping cough	0	6
Diphtheria and croup	0	1
Influenza	3	2
Erysipelas	0	1
Septicaemia	0	1
Tetanus	2	0
Tuberculosis of lungs	15	7
Tuberculous meningitis	2	2
Other forms of tuberculosis	4	2
Venereal diseases	1	0
Cancer and other malignant tumors	16	8
Rheumatism	1	1
Diabetes	3	3
Exophthalmic goitre	1	0
Anaemia, chlorosis	3	3
Other general diseases	0	4
Alcoholism	1	1
Simple meningitis	0	2
Cerebral hemorrhage, apoplexy	18	14
Softening of the brain	1	0
Paralysis	0	5
General paralysis of insane	0	1
Other forms of mental alienation	1	0
Epilepsy	0	1

DEATHS IN MUSCATINE, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Convulsions of infants	1	1
Other diseases of nervous system	0	3
Acute endocarditis	0	2
Organic diseases of heart	10	16
Diseases of arteries, atheroma, aneurysm, etc.	2	1
Embolism and thrombosis	0	1
Hemorrhage; other diseases of circulatory system	0	1
Bronchitis	6	4
Bronchopneumonia	0	3
Pneumonia	16	20
Pulmonary congestion	2	2
Asthma	2	0
Ulcer of stomach	0	1
Other diseases of stomach	3	9
Diarrhoea and enteritis (under 2 years)	3	1
Diarrhoea and enteritis (2 years and more)	3	2
Appendicitis and typhlitis	5	1
Hernia and intestinal obstruction	2	4
Cirrhosis of liver	2	6
Other diseases of liver	3	2
Peritonitis	0	1
Other diseases of digestive system	1	1
Acute nephritis and Bright's disease	17	13
Diseases of the bladder	1	0
Diseases of prostrate	0	2
Noncancerous tumors and other diseases female genital organs	2	0
Puerperal septicaemia	0	0
Other puerperal diseases	3	0
Gangrene	2	0
Malformations and injuries at birth	3	3
Premature birth	6	4
Congenital debility, atrophy, marasmus, etc.	10	4
Other causes peculiar to early infancy	2	1
Senility	28	18
Suicide	2	2
Acute poisonings	1	0
Burns	2	1
Accidental drowning	3	4
Traumatism by firearms	1	0
Traumatism by fall	3	1
Traumatism by other crushing	1	0
Railroad accidents	0	2
Street car accidents	1	1
Injuries by other vehicles	0	1
Injuries by animals	1	0
Effects of heat	0	1
Fractures	1	0
Homicide	0	1
Not specified or ill-defined	0	4
Total	226	216
Stillbirths	12	14

DEATHS IN OTTUMWA, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	179	156
Females	138	156
Total	317	312
White	306	300
Colored	11	12
Total	317	312
Native	264	277
Foreign	51	29
Unknown	12	6
Total	317	312
Single	107	126
Married	125	116
Widowed	76	64
Divorced	6	4
Unknown	3	2
Total	317	312
Under 1 year	44	59
1 to 5 years	13	13
5 to 10 years	5	5
10 to 20 years	14	16
20 to 30 years	25	31
30 to 40 years	25	29
40 to 50 years	22	19
50 to 60 years	38	28
60 to 70 years	44	40
70 to 80 years	44	47
80 to 90 years	35	21
90 years and over	4	4
Unknown	4	1
Total	317	312
Typhoid fever	5	2
Measles	0	1
Scarlet fever	0	2
Whooping cough	0	4
Diphtheria and croup	3	6
Influenza	1	0
Erysipelas	2	2
Septicaemia	2	2
Rabies	0	1
Tuberculosis of lungs	22	30
Tuberculous meningitis	2	0
Other forms of tuberculosis	2	4
Venereal diseases	1	0
Cancer and other malignant tumors	29	22
Rheumatism	2	0
Diabetes	1	0
Exophthalmic goitre	2	0
Anaemia, chlorosis	4	3
Other general diseases	2	0
Alcoholism	1	1
Simple meningitis	3	1
Locomotor ataxia	1	1
Acute anterior poliomyelitis	0	1
Cerebral hemorrhage, apoplexy	29	14
Paralysis	1	3
General paralysis of insane	0	2
Other forms of mental alienation	1	0

DEATHS IN OTTUMWA, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Epilepsy	4	1
Convulsions of infants	2	1
Other diseases of nervous system	1	3
Acute endocarditis	0	1
Organic diseases of heart	23	25
Angina pectoris	4	1
Diseases of arteries, atheroma, aneurysm, etc.	10	7
Embolism and thrombosis	4	2
Hemorrhage; other diseases of circulatory system	3	1
Bronchitis	2	1
Bronchopneumonia	6	6
Pneumonia	20	27
Pulmonary congestion	0	1
Asthma	1	0
Other diseases of respiratory system	1	1
Ulcer of stomach	1	2
Other diseases of stomach	2	2
Diarrhoea and enteritis (under 2 years)	6	9
Diarrhoea and enteritis (2 years and more)	1	3
Appendicitis and typhlitis	2	4
Hernia and intestinal obstruction	2	2
Cirrhosis of liver	1	3
Other diseases of liver	6	5
Peritonitis	6	1
Other diseases of digestive system	1	3
Acute nephritis and Bright's disease	17	24
Other diseases of kidneys	0	3
Diseases of prostrate	1	1
Noncancerous tumors and other diseases female genital organs	1	2
Puerperal septicaemia	3	0
Other puerperal diseases	1	1
Gangrene	2	2
Other diseases of the skin and annexa	0	1
Malformations and injuries at time of birth	3	2
Premature birth	9	18
Congenital debility, atrophy, marasmus, etc.	7	9
Other causes peculiar to early infancy	3	1
Senility	17	11
Suicide	6	6
Acute poisonings	1	0
Absorption of deleterious gases. Suffocation	0	1
Accidental drowning	2	2
Traumatism by firearms	1	0
Traumatism by fall	3	0
Traumatism in mines	1	0
Traumatism by machines	1	0
Railroad accidents	7	8
Automobile accidents	1	3
Fractures	3	0
Homicide	0	2
Not specified or ill-defined	3	2
Total	317	312
Stillbirths	17	15

DEATHS IN SIOUX CITY, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	374	391
Females	280	309
Total	654	700
White	649	692
Colored	5	8
Total	654	700
Native	488	502
Foreign	146	168
Unknown	20	40
Total	654	700
Single	267	291
Married	272	274
Widowed	103	107
Divorced	2	10
Unknown	10	18
Total	654	700
Under 1 year	147	123
1 to 5 years	24	45
5 to 10 years	18	14
10 to 20 years	17	32
20 to 30 years	50	71
30 to 40 years	61	71
40 to 50 years	60	78
50 to 60 years	91	80
60 to 70 years	84	81
70 to 80 years	62	58
80 to 90 years	32	39
90 years and over	7	4
Unknown	1	4
Total	654	700
Typhoid fever	6	8
Measles	1	7
Scarlet fever	1	0
Whooping cough	3	2
Diphtheria and croup	5	6
Influenza	5	6
Erysipelas	1	3
Septicaemia	14	10
Tetanus	0	1
Tuberculosis of lungs	33	37
Tuberculous meningitis	2	9
Pott's disease	0	3
Other forms of tuberculosis	3	4
Venereal diseases	2	5
Cancer and other malignant tumors	47	39
Rheumatism	0	2
Diabetes	6	9
Exophthalmic goitre	1	2
Leukemia	3	0
Anaemia, chlorosis	1	7
Other general diseases	3	6
Alcoholism	3	7
Simple meningitis	3	5
Cerebrospinal meningitis	2	0
Acute anterior poliomyelitis	1	0
Cerebral hemorrhage, apoplexy	41	28
Softening of the brain	1	0

DEATHS IN SIOUX CITY, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Paralysis	2	6
General paralysis of insane	1	2
Other forms of mental alienation	1	1
Convulsions of infants	5	4
Neuralgia and neuritis	1	1
Other diseases of nervous system	1	4
Diseases of the ears	1	0
Acute endocarditis	5	9
Organic diseases of heart	48	40
Angina pectoris	7	0
Diseases of arteries, atheroma, aneurysm, etc.	8	11
Embolism and thrombosis	3	12
Hemorrhage; other diseases of circulatory system	5	1
Bronchitis	3	5
Bronchopneumonia	6	11
Pneumonia	50	48
Pulmonary congestion	3	4
Asthma	1	2
Other diseases of respiratory system	2	6
Ulcer of stomach	3	2
Other diseases of stomach	5	10
Diarrhoea and enteritis (under 2 years)	23	15
Diarrhoea and enteritis (2 years and more)	0	5
Appendicitis and typhlitis	7	25
Hernia and intestinal obstruction	11	14
Cirrhosis of liver	9	5
Other diseases of liver	11	11
Peritonitis	19	12
Other diseases of digestive system	0	2
Acute nephritis and Bright's disease	28	47
Other diseases of kidneys	2	3
Diseases of the bladder	2	1
Diseases of prostrate	2	3
Noncancerous tumors and other diseases female genital organs	2	4
Puerperal septicaemia	4	8
Other puerperal diseases	5	3
Gangrene	2	0
Other diseases of the skin and annexa	0	3
Diseases of bones and organs of locomotion	0	3
Malformations and injuries at birth	12	9
Premature birth	42	27
Congenital debility, atrophy, marasmus, etc.	20	24
Other causes peculiar to early infancy	8	4
Senility	35	27
Suicide	9	11
Burns	2	3
Absorption of deleterious gases. Suffocation	6	7
Accidental drowning	5	2
Traumatism by firearms	1	0
Traumatism by fall	6	9
Traumatism by machines	0	1
Traumatism by other crushing	1	1
Railroad accidents	10	3
Street car accidents	2	0
Automobile accidents	0	6
Motorcycle accidents	1	0
Injuries by other vehicles	0	3
Injuries by animals	1	3
Excessive cold	1	0
Effects of heat	1	0
Other external violence	1	4
Electricity (except lightning)	1	0
Fractures	3	0
Homicide	2	1
Not specified or ill-defined	7	7
Total	654	700
Stillbirths	42	33

DEATHS IN WATERLOO, IOWA, FOR 1912 AND 1913.
(Exclusive of stillbirths.)

	1912	1913
Males	171	175
Females	151	161
Total	322	336
White	322	330
Colored	0	6
Total	322	336
Native	259	279
Foreign	59	54
Unknown	4	3
Total	322	336
Single	124	149
Married	124	125
Widowed	64	57
Divorced	5	4
Unknown	5	1
Total	322	336
Under 1 year	56	79
1 to 5 years	20	17
5 to 10 years	6	8
10 to 20 years	11	16
20 to 30 years	27	28
30 to 40 years	23	28
40 to 50 years	26	21
50 to 60 years	26	31
60 to 70 years	34	39
70 to 80 years	47	48
80 to 90 years	40	17
90 years and over	6	3
Unknown	0	1
Total	322	336
Typhoid fever	3	7
Measles	0	1
Scarlet fever	0	3
Whooping cough	2	4
Diphtheria and croup	7	2
Influenza	1	1
Erysipelas	1	0
Septicaemia	2	3
Tetanus	1	2
Tuberculosis of lungs	16	15
Tuberculous meningitis	1	1
Other forms of tuberculosis	1	9
Venereal diseases	2	0
Cancer and other malignant tumors	18	20
Rheumatism	2	2
Diabetes	2	7
Leukemia	0	1
Anaemia, chlorosis	1	3
Other general diseases	1	4
Simple meningitis	6	10
Cerebrospinal meningitis	8	0
Acute anterior poliomyelitis	0	1
Cerebral hemorrhage, apoplexy	18	16
Paralysis	5	3
General paralysis of insane	1	0
Convulsions of infants	1	2
Other diseases of nervous system	1	4

DEATHS IN WATERLOO, IOWA, FOR 1912 AND 1913—Continued.
(Exclusive of stillbirths.)

	1912	1913
Diseases of the ears	1	0
Acute endocarditis	1	4
Other diseases of heart	26	27
Angina pectoris	1	2
Diseases of arteries, atheroma, aneurysm, etc.	2	3
Embolism and thrombosis	6	6
Hemorrhage; other diseases of circulatory system	0	2
Bronchitis	5	1
Bronchopneumonia	2	4
Pneumonia	22	30
Pulmonary congestion	2	1
Asthma	0	2
Other diseases of respiratory system	1	2
Ulcer of stomach	0	2
Other diseases of stomach	3	4
Diarrhoea and enteritis (under 2 years)	13	10
Diarrhoea and enteritis (2 years and more)	6	2
Appendicitis and typhlitis	2	2
Hernia and intestinal obstruction	7	3
Cirrhosis of liver	2	0
Other diseases of liver	4	3
Peritonitis	2	1
Other diseases of digestive system	0	1
Acute nephritis and Bright's disease	26	25
Other diseases of kidneys	1	1
Diseases of the bladder	1	1
Diseases of prostrate	3	0
Puerperal septicaemia	1	1
Other puerperal diseases	2	0
Gangrene	1	1
Malformations and injuries at birth	6	9
Premature birth	16	23
Congenital debility, atrophy, marasmus, etc.	4	10
Senility	22	9
Suicide	2	6
Acute poisonings	1	0
Burns	2	1
Absorption of deleterious gases. Suffocation	1	1
Accidental drowning	4	3
Traumatism by other crushing	2	0
Railroad accidents	5	1
Street car accidents	0	1
Automobile accidents	1	0
Motorcycle accidents	1	0
Injuries by other vehicles	0	1
Injuries by animals	0	1
Other external violence	1	2
Electricity (except lightning)	0	1
Fractures	4	1
Homicide	0	3
Not specified or ill-defined	6	1
Total	322	336
Stillbirths	11	21

EMBALMERS' DEPARTMENT.

On the 30th day of June, 1914, there were in the state of Iowa 1,197 licensed embalmers in good standing with the Iowa State Board of Health.

During the biennial period, July 1, 1912, to June 30, 1914, there were 109 embalmers' licenses issued upon examination and 11 through reciprocity, making a total of 120.

Iowa has reciprocity with Colorado, Idaho, Illinois and Wisconsin.

DISINTERMENTS.

During the biennial period ending June 30, 1914, a total of disinterment permits were issued from the State Board of Health office as follows:

	1912-13		1913-14
July	98	July	182
August	70	August	69
September	130	September	95
October	211	October	165
November	124	November	157
December	84	December	72
January	30	January	80
February	23	February	23
March	36	March	42
April	139	April	98
May	97	May	137
June	134	June	64
Total	1,175	Total	1,179

Special disinterment permits issued..... 157

Total number of permits issued 2,511

NURSES' DEPARTMENT.

At the end of the biennial period, June 30, 1914, there were 1,667 nurses registered in Iowa. Of this number, 447 were granted certificates during the last biennial period.

Since January 1, 1910, all nurses who have applied for registration were required to pass an examination, as the time for registration without examination, as fixed by law, expired January 1, 1910.

At this time reciprocity with other states has not yet been established.

BOARD OF MEDICAL EXAMINERS.

The total number of physicians registered and practicing in this state June 30, 1914.....3,733

Ratio 1 to every 595.

Number of certificates issued during biennial period..... 285

Number of certificates issued upon examination..... 237

Number of certificates issued under reciprocal agreements with other states 48

Number of itinerants' licenses issued during biennial period..... 19

Number of osteopathic certificates issued..... 62

The state board of medical examiners, believing that the standard of medical education should be advanced, has adopted a preliminary requirement; therefore, all persons contemplating the study of medicine, surgery and obstetrics, or who expect to appear before the Iowa state board of medical examiners for examination must be graduates of a fully accredited* high school, academy, or seminary in which at least two years of foreign language is required, and, in addition thereto, two full years of college work in an accredited college, which shall include at least ten semester hours† of chemistry, ten of physics (or six, if one year in the subject was done in high school), six of biology, and ten of foreign language. The foreign language taken in college must include enough Latin to make the total Latin taken in high school and college together equal to two years' work in that subject.

All colleges requiring a lesser standard of qualifications will not be considered in good standing with the Iowa state board of medical examiners.

OPTOMETRY DEPARTMENT.

At the end of the biennial period, June 30, 1914, there were 672 Optometrists registered in Iowa. Of this number, 13 were granted certificates during the last biennial period.

*By an "accredited" high school, academy and seminary is meant one that has been inspected and fully accredited by the state university of the state in which it is located; or, in other words, a high school, academy or seminary, a diploma from which would admit the holder to the college of liberal arts of the state university of Iowa without examination. The matriculation examination for entrance on the study of medicine must be conducted by one especially qualified and not by any member of the medical faculty. Any disputes arising as to an accredited school or as to the standard of examination for applicants for matriculation shall be referred for settlement to the Iowa state inspector of schools.

†By "semester hour" is meant a subject taken for one hour a week during one semester. This equals from sixteen to eighteen hours of didactic class-room work or thirty-two to thirty-six or more hours of laboratory work.

Since September 30, 1909, all optometrists who have applied for registration were required to pass an examination, as the time for registration without examination, as fixed by law, expired September 30, 1909.

Total number of certificates of exemption..... 549
Total number of certificates issued upon examination..... 123

Total number of certificates in force June 30, 1914..... 672

FIFTH BIENNIAL REPORT OF THE DIRECTOR OF THE IOWA STATE BOARD OF HEALTH BACTERIOLOGICAL LABORATORY.

(July 1, 1912—July 1, 1914.)

I herewith submit the fifth biennial report of the director of the state board of health bacteriological laboratory, giving an account of the work done and expenditures made during the past two years.

NUMBER AND KIND OF EXAMINATIONS.

During the past biennium 35,432 examinations were made and preventive treatments given in the bacteriological laboratories of the Iowa state board of health. 27,276 examinations were made and 3,104 preventive treatments were given at the central laboratory at Iowa City, and 5,052 examinations were made in the auxiliary laboratories of the state board of health. Of the total number, there were 15,684 examinations for diphtheria, 4,180 examinations for typhoid fever, 7,086 examinations for tuberculosis and 5,378 miscellaneous examinations, and 1,925 preventive treatments for rabies, 723 vaccinations for smallpox and 456 vaccinations for typhoid fever.

TABLE NO. 1.

(Number and kind of examinations and treatments.)

KIND OF SPECIMEN	Positive	Negative	Diagnosis reserved	Total
Diphtheria	6,103	9,358	223	15,684
Typhoid fever	1,243	2,866	81	4,180
Tuberculosis	1,190	5,896	------	7,086
Miscellaneous at the central laboratory—				
Water	------	------	------	191
Rabies	------	------	------	85
Cerebro-spinal meningitis	------	------	------	18
Glanders	------	------	------	6
Tissue	------	------	------	186
Animal inoculations	------	------	------	440
Secretions, excretions and exudates, etc.	------	------	------	4,496
Miscellaneous (total) from the auxiliary laboratories	------	------	------	28
Preventive treatments—				
Pasteur for rabies—77 persons @ 25 treatments each	------	------	------	1,925
Smallpox	------	------	------	723
Typhoid—152 persons @ 3 treatments each	------	------	------	456
Grand total	------	------	------	35,432

DIPHTHERIA—Of the 15,684 examinations for diphtheria, 5,150 were for diagnosis, of which 2,000 were positive, 3,026 negative and 124 questionable; 10, 534 were for release from quarantine, of which 4,103 were positive, 6,332 negative and 99 questionable.

TYPHOID FEVER—Of the 4,180 examinations for typhoid fever, 1,243 were positive 2,866 negative and 81 questionable.

TUBERCULOSIS—Of the 7,086 sputum examinations, 1,190 were positive and 5,896 negative.

WATER EXAMINATIONS—Water examinations were made to determine the sources of cases or epidemics of typhoid fever. Of the 191 specimens of water examined, evidence of pollution with sewage material was found in 42 specimens. In 14 instances the water examination revealed quite definitely the source of typhoid fever.

AUXILIARY LABORATORIES.

TABLE NO. 2.

(Examinations made at auxiliary laboratories.)

LOCALITY	In Charge of	Diphtheria	Typhoid fever	Tuberculosis	Miscellaneous	Total
Sioux City	E. J. Meis	389	43	134	------	566
Mason City	A. C. Echternacht	------	------	------	------	234
Davenport	T. W. Kemmerer	107	------	15	11	133
Des Moines	L. S. Ross	2,051	29	74	2	2,156
Waterloo	W. M. Shirley	340	------	4	------	344
	Ben C. Ecerall	455	35	80	------	570
Burlington	E. J. Wehman	150	45	39	815	1,049
Oskaloosa	M. F. Boyd					5,052
	Grand total					

RABIES.

During the past two years 106 examinations were made in the laboratory for evidence of rabies or hydrophobia.

TABLE NO. 3.

(Kind and number of animals examined for evidence of rabies.)

Dogs	87	Hogs	4
Cats	6	Sheep	2
Horses	2	Cattle	5

A positive report is given when either Negri bodies are found on microscopical examination, or when the disease develops in an inoculated animal. In a number of cases the brain was so destroyed, or the specimen so putrid that a satisfactory laboratory examination could not be made. It should be borne in mind, also, that the laboratory examination does not always reveal the disease, even if it exists; for that reason, it is exceedingly important that the animal which does the biting should not be

killed, but be confined and watched. If the animal does not develop typical symptoms or die within ten days, it is safe to say that it was not affected by rabies. If the animal cannot be secured without danger to others, it should be shot through the heart, rather than the head. The development of so many cases of rabies in Iowa is due, I am sure, to the fact that the people are not sufficiently informed as to the possibility of eradicating the disease. There is no fact in preventive medicine better established than that rabies may be entirely exterminated. If all stray or unlicensed dogs were killed, and if, when the disease makes its appearance in a community, all dogs were muzzled for a period of six months, the disease can be practically stamped out in the course of a few years.

In a paper on "Rabies in Iowa," presented by the director of the laboratory at the last meeting of the Iowa State Medical Society, he discusses the number of cases and distribution of rabies in the state during the past five years. Directions for the sending of specimens for examination and recommendations aiming at the ultimate extermination of the disease are also given.

PASTEUR TREATMENT.

During the past two years 105 persons applied for the Pasteur treatment for the prevention of rabies. The treatment was given to 77, it being found unnecessary to give it to the remainder, because of the absence of rabies in the animal which did the biting. The patients who received the Pasteur treatment have come from the following localities:

TABLE NO. 4.

(Localities from which patients (number given) come to receive the Pasteur treatment for the prevention of rabies.)

Afton	2	Mt. Union	1
Albia	2	Muscatine	1
Albion	1	New Market	1
Bedford	4	North Liberty	4
Burlington	4	North English	1
Brighton	1	Nodaway	2
Chariton	1	Ollie	1
Clarinda	3	Omaha	1
Charles City	1	Ottumwa	10
Council Bluffs	3	Palmer	1
Davenport	1	Reinbeck	1
Eldon	6	Ridgeway	2
Farmington	1	Rippey	1
Gowrie	1	Selma	2
Green Island	1	Shambaugh	2
Hastings	1	Sigourney	1
Kalona	1	Sioux Falls	1
Keokuk	2	St. Anthony	1
Kellerton	1	Villisca	1
Lorenz	1	Winfield	1
Malvern	1		
Manson	1	Total	77
Millersburg	1		

In none of the cases, except one, did rabies develop. In one instance, the patient succumbed to rabies about three weeks after the treatment was given. The explanation offered is that the patient received an unusually severe bite in the region of one of the large nerves at the ankle; also that the disease was probably unusually virulent, in as much as another dog and two pigs bitten by the same dog which bit the patient developed the disease within three weeks after infection. The usual period of incubation is about six weeks.

ANTI-SMALLPOX VACCINATION.

The vaccinations for the prevention of smallpox were made almost entirely on students at the university during the early portion of 1914, following the development of several cases of the disease among the students.

While making the vaccination, the director of the laboratory and assistant bacteriologist, Mr. A. M. Alden, conducted a number of experiments with the idea of preventing the development of sore arms. The greatest success was obtained with the use of tincture of iodine, applied immediately after the vesicle had formed. The results of the investigations were embodied in an article on "Vaccination and Sore Arms," published in the April, 1914, number of the Iowa Medical Journal.

ANTI-TYPHOID VACCINATION.

The persons who received the vaccination for the prevention of typhoid fever consisted of students in the university, of physicians and nurses who came to the laboratory, and in, a few instances, in localities where typhoid fever was prevalent. There is no doubt but that anti-typhoid vaccination protects the system from typhoid fever to a very marked degree. I believe that it should be much more generally used, especially by persons living in communities with sewage-polluted water supplies, or by those who do considerable traveling, or otherwise are rather freely exposed to infection.

EPIDEMICS.

THE FORT DODGE EPIDEMIC OF TYPHOID FEVER—During 1912 there was an epidemic of typhoid fever at Fort Dodge. About 80 cases of the disease developed. An investigation was made by Mr. A. M. Alden of the laboratory and Dr. Carrington of the United States Public Health Service. They located the source of the epidemic in the city water supply, which was contaminated by water from the river. A complete copy of Mr. Alden's report is appended.

THE BARNES CITY EPIDEMIC OF TYPHOID FEVER—During the spring of 1914 there was a serious epidemic of typhoid fever at Barnes City. This was investigated by Mr. Lafayette Higgins, engineer of the board, Mr. Alden of our laboratory and several others working under the direction of Mr. Higgins. The source of the epidemic was traced to the water supply, which was obtained entirely from shallow wells.

THE VINTON EPIDEMIC OF DIPHTHERIA—During the fall of 1912 there was a mild, yet serious, epidemic of diphtheria at Vinton. The disease occurred principally among the school children. The epidemic was traced to carriers as the source of the infection. An examination of the throat of every school child was made, as a result of which it was found that

about 16 per cent were carriers of diphtheria bacilli. The isolation of these children until they were free from diphtheria bacilli led to the prompt cessation of the epidemic.

The work of Dr. J. E. Luckey, the local health officer is to be highly commended. Had it not been for his aggressive campaign and the co-operation of the physicians, school board and council of that city, the epidemic would, in all probability, have continued for a much longer time, as has been the case in a number of other cities where less active measures to suppress the disease were taken.

The importance of diphtheria carriers in the transmission of the disease is as yet appreciated by few. Dr. Luckey devoted his address, as chairman of the section of medicine, at the last meeting of the State Medical Society to a consideration of this important subject.

THE NEWTON EPIDEMIC OF DIPHTHERIA—During the spring of 1914 a small, but severe, epidemic of diphtheria occurred at Newton, Iowa. Although there were only about twenty-four cases of the disease, the mortality was unusually high. At the request of Dr. Sumner, Mr. Alden, of our laboratory, investigated the epidemic and found that the greater part of the epidemic was due to healthy carriers of virulent diphtheria bacilli.

Through the efficient work of Mayor Beard and the physicians of that city, all carriers of the specific bacteria were quarantined. The epidemic ceased immediately. At this time practically all of the carriers have been released from quarantine on the basis of negative findings in the bacteriological examinations. A copy of the report is appended.

RESEARCH WORK.

The work of the laboratory furnishes abundant opportunity for research. Unfortunately, the time of the employes is so fully occupied in routine work that there is not much time left for original investigation. The problems which presented themselves for solution were, however, so important that the director of the laboratory, with the aid of his assistants, has carried on research work along the following lines:

THE TREATMENT OF DIPHTHERIA CARRIERS—The length of time during which diphtheria bacilli may remain in the nose and throat of persons who have either recovered from the disease or been exposed to infection, makes it highly desirable that some method should be devised to get rid of the diphtheria bacilli as rapidly as possible. The director of the laboratory carried on a series of experiments, both in the laboratory and in the clinic, through the courtesy of Professor Dean, to devise some method of getting rid of the diphtheria bacilli quickly. The best results were obtained by swabbing the crypts of the tonsils with a 10 per cent solution of silver nitrate. The results of these experiments, together with a description of other methods, were embodied in a paper on "The Treatment of Diphtheria Carriers," which the director presented at the 1913 meeting of the American Medical Association. A copy of the paper is appended.

The Staphylococcus-Spray Treatment of Diphtheria Carriers, by A. M. Alden. This is the subject of a paper published in the Journal A. M. A., June 14, 1913, page 1876, and represents the evidence as to the efficacy of a spray of a pure culture of living staphylococci to aid in the removal of diphtheria bacilli from the nose and throat. The conclusion is that this treatment is of considerable value.

Sewage Pollution of the Missouri River, by Henry Albert, M. E. Scheetz and A. M. Alden. This was an investigation made in co-operation with the United States Public Health Service. The results of the investigation were published in Bulletin No. 89 of the Hygienic Laboratory of the United States Public Health Service.

The Period of Incubation of Diphtheria Cultures, by Henry Albert. This represents a study of 854 specimens carried on during the months of March, April and May, 1913, to determine whether or not it is worth while to make examinations of cultures of diphtheria at 9 o'clock p. m., after an incubation of twelve hours. The conclusion is that such is worth while since 18 per cent of the specimens, which eventually prove to be positive, will be received by the attending physician twelve to twenty-four hours earlier than when the examination is left until the following morning.

The results of this investigation were presented by the author at the meeting of the American Public Health Association, which was held at Colorado Springs, September, 1913, and published in the July, 1914, number of the American Journal of Public Health.

Vaccination and Sore Arms, by Henry Albert and A. M. Alden. While vaccinating about 800 students for the prevention of smallpox during February, 1914, experiments were made to determine if it is possible to prevent the development of sore arms in connection with vaccination. The greatest success was obtained by the application of tincture of iodine to the vesicle soon after its formation. The results were published in the April, 1914, number of the Iowa Medical Journal. A copy is appended.

CULTURE STATIONS AND DIAGNOSIS OUTFITS.

There are at the present time 884 culture stations of the bacteriological laboratory. These are located in 774 cities and towns. During the past biennium 45,357 diagnosis outfits have been supplied to the various culture stations. Of these 29,280 were for diphtheria, 7,295 for typhoid fever, and 7,782 for tuberculosis outfits.

The establishment of culture stations has brought the benefits of the laboratory of the state board of health very close to the people of the state. The supplying of the culture stations with the diagnosis outfits makes such available to all physicians at any time and without charge. In many other states the outfits are sent to physicians only on request and at their expense. This, no doubt, accounts for the unusually large number of physicians in Iowa who make use of the laboratory.

PARCEL POST.

A new regulation of the post office department enables the laboratory outfits for diphtheria and tuberculosis to be sent by parcel post. This has reduced the postage on the diphtheria outfit from 8c to 4c in all

parts of the state and on the tuberculosis outfit from 12c to 5c-8c, depending on the distance from Iowa City. A great saving in postage is thereby affected.

TABLE NO. 5.

(Giving the number of examinations made annually and biennially since the establishment of the laboratory.)

July 1st, 1904—July 1st, 1905	3,580	8,779—First Biennial Period
July 1st, 1905—July 1st, 1906	5,199	
July 1st, 1906—July 1st, 1907	8,453	17,289—Second Biennial Period
July 1st, 1907—July 1st, 1908	8,856	
July 1st, 1908—July 1st, 1909	10,437	22,961—Third Biennial Period
July 1st, 1909—July 1st, 1910	12,524	
July 1st, 1910—July 1st, 1911	13,437	27,078—Fourth Biennial Period
July 1st, 1911—July 1st, 1912	13,641	
July 1st, 1912—July 1st, 1913	17,464	35,432—Fifth Biennial Period
July 1st, 1913—July 1st, 1914	17,968	

SCOPE OF WORK.

At the present time the aim is to limit the scope of work of the laboratory, as far as possible, to the routine diagnosis for tuberculosis, typhoid fever, diphtheria and rabies, release from quarantine for diphtheria and Pasteur treatment for the prevention of rabies. We frequently receive inquiries in regard to examinations for evidence of venereal infection, as well as many other kinds of bacterial examinations and preventive treatments. We have complied with these requests as far as possible, but, on account of lack of funds, it has not been thought advisable to throw the doors of the laboratory wide open for all kinds of examinations. If the scope or amount of work should be increased, it will require an additional support fund and the service of additional assistants.

FINANCIAL REPORT. CLASSIFIED SUMMARY OF EXPENDITURES FOR BIENNIUM JULY 1, 1912—JULY 1, 1914.

PERMANENT EQUIPMENT:

Furniture	$ 85.85	
Apparatus	645.51	
Diagnosis outfits	934.64	
		$ 1,666.00

CURRENT EXPENSE:

Salaries	$ 6,633.06	
Express	283.35	
Postage	962.63	
Animals and feed	457.93	
Travel expense	188.43	
Printing	269.35	
Telegraph and telephone	71.30	
General laboratory expense	1,467.95	
		$10,334.00
Total		$12,000.00

Copies of the bills and receipts for the payment of same have been filed with the secretary of the state board of health and the secretary of the executive council and the state auditor.

RECOMMENDATIONS.

I—AUXILIARY LABORATORIES:

1. That an auxiliary laboratory be established at Little Rock, Iowa, with Dr. Ferdinand J. Smith as bacteriologist in charge.
2. That Dr. James Christiansen be appointed bacteriologist in charge of the auxiliary laboratory at Sioux City, to take the place of Dr. E. W. Mies, resigned.

II—CENTRAL LABORATORY AT IOWA CITY:

1. That the salary of Miss Minnie Hamilton, clerk and stenographer, be increased by $9, and that of Harvey Chensky by $5 per month, making the payroll for the coming year as follows:

H. E. Harlow, assistant bacteriologist	$1,500.00
Leo Musgrove, technician	840.00
Minnie Hamilton, clerk and stenographer	540.00
Harvey Chensky, attendant	480.00

Very respectfully submitted,
HENRY ALBERT.

LENGTH OF QUARANTINE.

At one time the rules and regulations of the State Board of Health fixed a certain number of days during which infected persons were to be kept in quarantine. This was an arbitrary method.

It should be observed that every case of a given disease was ordered kept in quarantine the same number of days, regardless of the fact that some cases were mild and others severe. While apparently this gave ample protection by keeping everyone in quarantine long enough, it tended to defeat its own object by reason of the antagonism it aroused.

People never make any objection when the patient is very sick. All the members of the stricken family realize the importance of care when the outlook is grave, and they will co-operate with the authorities to keep the disease from spreading. It will be observed, however, that in **mild cases** the laity cannot realize the importance of the same care. They can scarcely believe that **mild smallpox** or **mild scarlet fever** may become **fatal smallpox** or **fatal scarlet fever** in the next exposure, and usually they doubt the diagnosis and feel rebellious about the quarantine restrictions.

It has been found that, by detaining in quarantine persons who are soon perfectly well, or apparently so, many mild cases of contagion have gone unreported in the past. For the physicians knew that, once the family was quarantined, the prescribed number of days must elapse before release would be possible, and so no amount of argument could ever convince the family that the physician was not to blame; hence, very many unscrupulous physicians avoided blame and abuse by failing and neglecting to report the mild cases.

Speaking of the old rules regarding diphtheria, it must be confessed that they were open to criticism; for it was provided that release cultures were not to be taken until after fourteen days had

elapsed, and that successive cultures should be taken at least forty-eight hours apart.

Following the above plan was unjust to many patients who were promptly treated with antitoxin, because these patients were often clinically well in two or three days, or five days at most, and if any dependence could be placed upon release cultures, there was no reason for waiting for fourteen days to lapse before taking the first release culture.

It would appear that if the throat and nose could be shown to be free from diphtheria bacilli by two successive cultures, taken sufficiently far apart, such a patient might be safely released.

After much observation in these matters and reasoning in this way, the Board established the new rule that release cultures may be taken five days after the membrane disappears, and they may be taken on successive days.

It was felt that the throat and nose are rarely free from bacilli in less than five days, and cultures taken before that time would be merely a waste of time.

This rule applies only to cases in which release cultures are taken. It is hardly possible now that a physician need release diphtheria in any other manner than by the culture method. The culture method should always be used where possible, as it is the only scientific method whereby it may be determined that diphtheria cannot be transmitted.

Smallpox and scarlet fever are the only other quarantinable diseases with which we are much concerned in Iowa, and these may now be released when the attending physician or Health Officer certifies in writing to the Mayor or Township Clerk that desquamation, or peeling off, is complete, and that the patient cannot transmit the disease to others. **A full report must however, be made in writing as above specified and must be approved by the Health Officer, and after fumigation and disinfection have been fully completed the quarantine may be lifted.**

If such reports are honestly made and the certificates properly filled out, the public will be perfectly safe, and if they are not, it is easy for the public to find out which physicians are jeopardizing the health of the community.

It is true that the rules and regulations of the State Board of Health leave more to the honesty of the attending physician, but after all, the honesty and integrity of the medical profession is the mainstay in public health matters under any rules.

It was hoped by the State Board of Health, that the modification of these rules would have the effect of inducing the people to meet the health authorities on medium ground in the matter of preventing communicable diseases, since each case is treated on its merits and is released as soon as it is possible to do so, in safety to the well.

The members of the State Board of Health feel it incumbent upon them to make quarantine as bearable as possible because the Thirty-third General Assembly through a mistaken idea of economy enacted a statute compelling the quarantined individual to bear all the expense of fumigation and disinfection.

Iowa State Board of Health,

Educational Articles

SUPPLEMENT TO THE FIFTH BIENNIAL REPORT OF THE DIRECTOR OF THE IOWA STATE BOARD OF HEALTH BACTERIOLOGICAL LABORATORY.

The following are papers and reports by members of the staff of the State Board of Health Bacteriological Laboratory:

1. Rabies in Iowa, by Henry Albert.
2. Vaccination and Sore Arms, by Henry Albert and A. M. Alden.
3. The Fort Dodge Epidemic of Typhoid Fever, by A. M. Alden.
4. Report on the Investigation of the Epidemic of Diphtheria at Newton, by A. M. Alden.
5. The Treatment of Diphtheria Carriers, by Henry Albert.
6. The Staphylococcus-Spray Treatment of Diphtheria Carriers, by A. M. Alden.
7. The Period of Incubation of Diphtheria Cultures, by Henry Albert.

RABIES IN IOWA.

BY HENRY ALBERT, M. D., IOWA CITY, IOWA.

Rabies (also called hydrophobia) is an expensive and unnecessary disease. It is on the increase in Iowa, as it is in most of the states of the Union.

In 1912 I presented a paper on "The Control of Rabies" at the Fifteenth International Congress of Hygiene and Demography.[1] While preparing that paper, I collected data in regard to the prevalence of hydrophobia and the means adopted to limit its spread, from all of the civilized countries of the world. Summarizing the more important data obtained at that time, I may say:

1. That rabies has never existed in Australia, due to the fact that no dogs are permitted to be introduced on that continent without first being subjected to a six months' quarantine.
2. That the disease has been exterminated from Great Britain, and practically so from Denmark, Norway and Sweden.
3. That hydrophobia is on the decline in Germany, France, and a number of other countries where sanitary science has received generous recognition.
4. That rabies is on the increase in Russia, Bulgaria, Italy, India and the United States, where the natural difficulties in way of eliminating the disease are somewhat greater, and where, we must admit, the people in general do not as fully realize the importance of preventive measures.

PREVALENCE OF RABIES IN IOWA.

At what time rabies first made its appearance in Iowa we do not know. From the long existence of the disease in the eastern states, we may judge that rabies gained entrance to this country by way of one

[1]Albert—The Control of Rabies. Transactions of the Fifteenth International Congress on Hygiene and Demography, 1912.

of the Atlantic seaports. It has taken a century to cross the continent, having been unknown in California until about three years ago, since which time it has rapidly spread in epidemic form throughout that state.

The data relative to the number of cases of rabies in Iowa previous to 1909 is very meager. That year marked the beginning of the Pasteur treatment for the prevention of rabies at the state board of health laboratory at Iowa City. The more important statistical data concerning the disease in Iowa during the past five years is presented in the following map:

Although the disease has been quite wide-spread, the great majority of the cases have occurred in the southern half of the state. During this time four distinct epidemics of rabies have occurred. In 1910 there was one in Boone county; in 1911, in Scott and Des Moines counties; in 1912, in Union and Montgomery counties, and 1913, in Wapello county, especially in the neighborhood of Eldon. This last named epidemic has been the most severe. The epidemiology in this case is fairly typical of rabies outbreaks. There was a sudden onset, during which time fourteen persons were bitten. The decline has been more gradual. During the time, however, two adjacent counties, Mahaska and Monroe, have been somewhat involved.

The work in connection with rabies done at the state board of health laboratory at Iowa City consists of the examination of specimens for evidence of hydrophobia and the administration of the Pasteur treatment for the prevention of the disease.

EXAMINATION OF SPECIMENS FOR EVIDENCE OF RABIES.

The laboratory examination for rabies consists of a search for Negri bodies, and, if such cannot be found, the making of an animal inoculation. The report on Negri bodies can be made in from one to three days; on the animal inoculation, in two to three weeks. For either examination, the brain of the animal is used. In order that the brain may be in proper condition for examination, it should be properly preserved. It should not be macerated by the shooting of the animal through the head or beating the skull to pieces with a club. It is not to be placed in preserving fluid nor allowed to decay. The head should, as soon as possible after the death of the animal, be severed from the body, wrapped in a piece of cloth, boxed and sent to the laboratory by first express. Except during the cold months of winter, the wrapped head should be surrounded by ice (preferably equal parts of cracked ice and sawdust). *But do not kill the animal unless necessary.* Laboratory examinations will not always reveal the existence of the disease. The animal should be kept in confinement and watched. If the condition is rabies, it will develop typical symptoms and die within ten days.

PASTEUR TREATMENT FOR THE PREVENTION OF RABIES.

The Pasteur treatment has largely robbed rabies of its terrors. Previous to 1886, when the treatment was first begun at the Pasteur Institute at Paris, the mortality from rabies of persons bitten by rabid, or presumably

rabid animals was 16 per cent (Le Blanc). Since that time more than 30,000 persons have received the preventive treatment at the Paris Institute, with a mortality of only 0.5 of 1 per cent. The result in other places has been about the same. This treatment consists of daily subcutaneous injections of an emulsion of the spinal cord of a rabbit, for a period of twenty-one days. The spinal cord used is from a rabbit which has developed the disease, but before being used the virulence of the rabies virus is diminished by the drying the cord a number of days.

The administration of the Pasteur treatment for the prevention of rabies was begun at the state board of health laboratory in 1909. The number of patients treated since that time and up to the close of the last annual report is 120, as shown by the following table. There was one death.

PASTEUR TREATMENTS GIVEN AT THE STATE BOARD OF HEALTH LABORATORY AT IOWA CITY.

	No. treated.
Feb. 11, 1909-July 1, 1909	7
July 1, 1909-July 1, 1910	8
July 1, 1910-July 1, 1911	32
July 1, 1911-July 1, 1912	35
July 1, 1912-July 1, 1913	38
Total	120

Patients should begin the Pasteur treatment as soon as possible after having been bitten by a "mad" dog. Inasmuch as the Pasteur treatment occasionally fails to produce the proper immunity, the wound should always be treated as soon as possible. Cauterization with fuming nitric acid or the application of a strong solution of formaldehyde seem to be the most serviceable local remedies. It is surprising that there are still localities where there is popular belief in the efficacy of a "mad" stone. As yet, we have nothing certain in way of a cure for the disease, once developed. The work of Moon[2] on the curative treatment of rabies in dogs, and the report of the cure of a probable case of human rabies by Harris[3] after the intravenous injection of fifteen grains of quinin and urea hydrochloride dissolved in three cubic centimeters of water, is of suggestive value and worthy of further trial. In our own laboratory, we (Albert and Alden) have, experimentally tried the use of quinin, salvarsan and neosalvarsan for the cure of the disease in rabbits, but did not get any favorable results. Haberlin[4] reports the cure of a case of human rabies by the use of subcutaneous injections of ten cubic centimeters of one per cent aqueous solution of phenol, repeated every hour for twelve hours.

The duty of physicians, as regards rabies, is not limited to its prevention after a person has been bitten. We should seriously attempt the

[2]Moon—1—Moon: The effect of Quinin on Rabies in Dogs. Journal Infect. Diseases, 1913, XIII-165.

[3]Harris—A clinical report of seven cases of hydrophobia together with a case clinically similar with recovery following the injection of quinin. Journal American Medical Association, Oct. 25, 1913, p. 1511.

[4]Haberlin—Apparent cure in case of hydrophobia, New York State Journal of Medicine, N. Y., Sept. XII, No. 9—pp. 457-510.

complete extermination of the disease. This can be done by reasonable and easily carried out measures directed toward the elimination of the disease from dogs.

REGULATIONS AIMING AT THE CONTROL OF RABIES IN DOGS AND THE EVENTUAL COMPLETE EXTERMINATION OF THE DISEASE.

1 LICENSING—Stray, ownerless dogs are the principal offenders, not only in spreading rabies, but in doing harm to live stock. Irrespective of the presence of rabies in a community, all dogs ought to be licensed and provided with a collar and license tax. All stray dogs should be caught and killed in a humane manner. It is not desirable to arouse the prejudice of the people by shooting dogs on the street.

2. MUZZLING—Wherever rabies is present in a given place, all dogs permitted to run at large should be kept muzzled for a period of at least six months after the disappearance of the last case from the locality. There is a difference of opinion as to the size of the territory in which dogs should be muzzled whenever the disease appears. Certainly it should not be less than a city of moderate size, or in rural communities, it should, in the United States, not be less than an average-sized township. If several cases occur at places several miles apart, it is advisable to have the regulations enforced over an area corresponding to a county. If the disease is widespread, it is certainly best to have the dogs of an entire state muzzled. The muzzling of dogs is the most important measure in preventing the spread of rabies in a community where the disease exists. The objection to muzzling comes from many well-meaning people who believe that it is cruel. It is not cruel to place a properly constructed (such as the basket type, made of metal) and well-fitting muzzle on a dog. Such muzzle will permit the dog to open its mouth, pant and drink, but not to bite. It is no more cruel to put a muzzle on a dog than a bit in a horse's mouth. Of course, the dog will resent it at first; so does the horse resent the bit. But once they become accustomed to it, they do not mind it. The good effect of this procedure has been demonstrated many times and in many places. Probably the best example is the result brought about in England, as is well shown by the following table:

NUMBER OF CASES OF RABIES IN GREAT BRITAIN.

Year.	No. of Cases. Dog.	Human
1887	217	29
1888	160	14
1889	312	30
Muzzling Enforced.		
1890	129	8
1891	79	7
1892	38	6
Opposition to Muzzling, Ordinance Relaxed.		
1893	93	4
1894	248	13
1895	672	20

Muzzling Again Enforced.		
1896	438	8
1897	151	6
1898	17	2
1899	9	0
1900	6	0
1901	1	0
1902	13	0
1903-07	0	0

Note that with the enforcement of the muzzling law the number of cases of rabies rapidly declined from 217 in 1877 to 38 in 1892. In 1892 the authorities yielded to the petition of "dog lovers" and permitted muzzling to be discontinued. As a result the disease rapidly increased in number, so rapidly that during the third year (1895) 672 dogs and 20 human beings died from rabies. The muzzling law was again enforced, the number of cases rapidly decreased and in 1902 entirely disappeared. Since that time no case of rabies has been recognized in Great Britain. Dogs are not muzzled in England at the present time, but we are informed that muzzling will be resumed with the appearance of a single new case of the disease. The existence of a muzzling act should require all dogs not muzzled to be killed by the proper health or police authorities. In some places the right to kill any unmuzzled dog is given to any person.

3. DETENTION OF DOGS—Valuable dogs that have been associated with rabid animals, and are therefore probably infected, should be confined to a kennel or shed for a period of not less than three months, and preferably six months. When taken out for exercise they should be muzzled and led in leash. When the disease is prevalent it is best to have all dogs confined. Females in heat should at no time be permitted to run at large.

4. DESTRUCTION OF DOGS—All dogs known to be affected by rabies or to have been bitten by rabid animals should be killed. The mistake that is usually made is to kill an animal immediately after that animal has bitten a person, on the suspicion that it may be affected by rabies. The importance of such an error is realized when we remember that it is not always possible to get laboratory evidence of the disease even when it exists. Whenever possible an animal that has bitten a person should be kept for a period of ten days. If the disease does not develop nor the animal die within that time it may be safely concluded that rabies does not exist.

5. QUARANTINE OF DOGS—To prevent the introduction of rabies into a country, all dogs that are imported should be held in quarantine for a period of six months. Australia owes to a rigid enforcement of such a law the fact that it has never had a case of rabies. England, likewise, depends on it to keep the country free from the disease. Such quarantine may likewise be applied to the smaller divisions of a country. During a recent outbreak of the disease in Canada it was prohibited to move dogs from the infested area. In Germany a certificate from an official veterinarian is necessary to have a dog moved from one section to another.

To exterminate rabies it is necessary that the general public should be

better informed regarding the disease, than it is at present, for without a co-operative public sentiment, not much can be hoped for.

The eradication of rabies is worth while for economic reasons because of the loss to the livestock industry. Efforts at its eradication are many times over justified by the loss of human life and the almost endless amount of worry which is now attached to the bite of a dog.

VACCINATION AND SORE ARMS.

HENRY ALBERT, M. D., AND A. MAXWELL ALDEN, A. M., IOWA CITY, IOWA.

It seems strange, in view of the great value of vaccination, for the prevention of small-pox, that many people should still be opposed to the procedure. This opposition is based, in part on ignorance; in part on prejudice; but in part, also, it must be admitted, on the fact that in many instances the vaccination is accompanied by rather severe reactions which cause the arms—the site usually chosen—to become quite sore. It is indeed the fear of a sore arm that causes some to state that they would rather have an attack of smallpox than to be vaccinated. There are many who prefer to take the chance of contracting the disease in preference to being immunized by vaccination.

In this paper, based on about 1,400 vaccinations, we shall attempt to show that both the sore arms and the fear of such, as exists at the present time, are quite unnecessary.

DEFINITION OF VACCINATION—The term *vaccination*, is derived from the latin word *vacca*, meaning a cow, since it is from such animals that the material used to vaccinate against small-pox is obtained. In recent years, however, we have been vaccinating for the prevention of other diseases, notably typhoid fever and rabies, and the material used for such is not obtained from a cow. The term *vaccine* has therefore come to be used to designate any virus or infective agent, the virulence or disease producing power of which has been attenuated or diminished, and the term *vaccination* has reference to the production of immunity to a given disease by the use of a vaccine regardless of how its virulence has been lessened.

VACCINATION FOR THE PREVENTION OF TYPHOID FEVER—The vaccine for the prevention of typhoid fever and indeed, for all diseases for which vaccines are used except small-pox, is administered by hypodermic injection. The question is frequently asked if vaccination against typhoid fever will produce sore arms, such as does vaccination against small-pox. The answer to such is that although the inflammation as represented by redness and swelling is just as great as in case of anti-small-pox vaccination, there are no superficial lesions with ulcer formation as in case of the latter, and that in case of the former, the inflammation entirely disappears in three or four days whereas in case of small-pox, it is often three or four weeks before the lesion is entirely healed. No one need to fear anti-typhoid vaccination because of sore arms.

VACCINATION FOR THE PREVENTION OF SMALL-POX—In case of small-pox vaccination, the material is introduced through an abrased wound. In

four to eight days, a vesicle and later a pustule is formed. The pustule represents superficial necrosis. The area of such superficial necrosis often becomes quite extensive through confluence of pustules or secondary infection with pyogenic bacteria. Such produces the "sore arm" of small-pox vaccination.

Due to the following reasons, sore arms are by no means of as frequent occurrence nor as severe at the present, as they formerly were:

1. Use of vaccine obtained from calves instead of human beings.
2. The greater precautions at cleanliness in the stables in which the animals from which the vaccine is obtained, are kept.
3. Using as vaccine, material obtained from the vesicles instead of pustules of calves.
4. The use of glycerine as a germicide for the destruction of the pus-producing bacteria which may have accidentally gained access to the vaccine.
5. More efficient government supervision of vaccine preparation.
6. Greater care in the technique of vaccination and its after-treatment.

In spite of these precautionary measures, however, sore arms are still of too frequent occurrence, due principally to the fact that most physicians simply vaccinate and leave subsequent treatment to the patient. The greatest danger associated with such is that of secondary infection with pyogenic bacteria. But even without such, the development of numerous vaccinia pustules, not caused by pyogenic bacteria, and more especially their confluence, will cause considerable necrosis with consequent ulcer formation.

We believe that pustule formation is not an essential of the immunizing process and that it is desirable to prevent pustule formation. With such prevented there is little or no necrosis of tissue, and consequently, little or no scar formation.

The presence of a scar has long been regarded as the evidence of a previous successful vaccination. Indeed many hold that unless a scar is produced the vaccination was not successful and likewise, the larger the scar, the more efficient the immunization. Our conception of the process which we find has also recently been expressed by Dyer,* implies that scar formation is neither necessary for, nor evidence of successful vaccination.

The question is—how may pustule formation be prevented? Dyer tried and recommends the opening of the vesicle with a pair of sterile scissors, painting the base of the vesicle with a solution of silver nitrate or pure carbolic acid (followed with alcohol) and then putting on a sterile dressing.

AUTHORS' EXPERIMENTS

We have found that the use of a caustic such as carbolic acid causes a somewhat more severe local reaction and a larger eschar and crust than is desirable. We did not find, as Dyer reports, that it prevented

REFERENCE.

*Dyer, Isador—The way to Vaccinate. Amer. Jour. of Trop. Diseases and Prev. Med. Vol. I, No. 6, Dec., 1913, pp. 447-452.

Reprint from Iowa Medical Journal, April 15, 1914.

secondary infection. We have therefore tried the use of tincture of iodine—applying it to the vesicle as soon as possible after such has formed and repeating the application two or three days later. By this method we succeeded in either preventing pustule formation or so limiting it that the several pustules which formed did not coalesce. As a result, the vesicles or pustules would soon dry up and form a small dry scab. In not one of 116 cases so treated was there secondary infection with pus-producing bacteria whereas in those not so treated, about 30 per cent were secondarily infected. In many of these, however, the pus formation other than that of the pustules of vaccinia, was but slight.

The use of tincture of iodine accomplishes, we believe, two desirable purposes, namely:

1. It destroys the vaccine virus in the superficial lesion—namely, the vesicle or pustule and thus prevents any further superficial necrosis.

2. It destroys the pus-producing bacteria which may have gained entrance and thus prevents secondary infection.

The question may properly be raised as to whether or not we are not simply aborting the process of vaccination, and that although "sore arms" are largely prevented, we may also be preventing a proper immunization of the patient.

We believe that there is no interference with the immunizing process because:

1. With the iodine treatment, there is no diminution of the reaction as indicated by redness and swelling of the subcutaneous tissue, and as represented by constitutional symptoms.

2. The germicidal action of the iodine is limited to the superficial tissue—probably not penetrating much below the epithelial cells whereas vaccine virus has no doubt, thoroughly invaded the underlying connective tissue.

3. There is no evidence to indicate that the antibodies which produce immunity are formed by the epithelial cells which may be destroyed but there is much evidence to show that such are produced by other cells of the body which are not destroyed.

TECHNIQUE USED BY US.

1. Cleanse the skin thoroughly with soap and water.

2. Sponge with alcohol. The alcohol should be allowed to dry off well so that the area will not be left antiseptic.

3. Abrase a small area (about one-fourth of an inch in diameter) of the skin by means of a sterile needle or knife. The epithelium should be scratched off until lymph (not blood) appears.

4. Apply the glycerinized vaccine and "rub" it in with the needle or knife.

5. Allow the vaccine to become absorbed until the surface is dry.

6. Apply sterile gauze fastened by adhesive strips.

7. Instruct patient to return in 5 to 7 days.

8. If vesicles have formed, paint them with tincture of iodine. If vesicles have not formed, have patient return every two days until the twelfth day to note presence of reaction. If there is no reaction by that time, revaccinate, if deemed necessary.

9. In case of a "take" instruct patient not to use the vaccinated limb for any violent exercise nor even extensive movements.

10. Two days after the first application of iodine, another application should be made and patient instructed to return in two days. If by that time a dry scab has formed with no evidence of pus beneath it, no more iodine is applied. The scab should, however, continue to be covered with sterile gauze for several weeks and the patient instructed to return, if there is evidence of pus formation.

11. In cases of secondary infection with pus formation, we have obtained best results by removing the scab and pus, painting the base of the ulcer with tincture of iodine and, when dry, covering it with bismuth subiodide powder. Superfluous granulation tissue is "touched up" with a stick of silver nitrate.

CONCLUSIONS.

1. The opposition to vaccination consists principally of a fear of "sore arms."

2. Both the "sore arms" and the fear of such are quite unnecessary.

3. Antityphoid vaccination does not produce any "sore arms" as represented by ulcers.

4. In vaccination, every precaution at asepsis should be taken.

5. The sore arms following anti-small-pox vaccination are due principally to secondary infection with pus-forming bacteria, and may be largely prevented by the use of tincture of iodine.

6. The abrased area in vaccination for the prevention of small-pox should be of small size (about one-fourth inch in diameter) and should be protected by sterile gauze for several weeks or until the scab has become thoroughly dried.

7. The vaccinated limb should be kept as quiet as possible—for that reason it is better to vaccinate on the arm than on the leg.

8. The physician should see the patient at least several times after the vaccination, to apply such after treatment as may be necessary.

INVESTIGATION OF THE EPIDEMIC OF TYPHOID FEVER AT FORT DODGE.

BY A. M. ALDEN, A. B., M. A.

Assistant Bacteriologist of the Bacteriological Laboratory of the State Board of Health, 1912.

Iowa City, Iowa, November 30, 1912.

Dr. G. H. Sumner, State Board of Health,
Des Moines, Iowa.

Dear Doctor:

In accordance with instructions from you and Dr. Richardson of the State Board of Health, I was assigned by Dr. Albert to go to Fort Dodge and assist Dr. Carrington in the investigation of the general sanitary conditions of that city with special reference to the epidemic of typhoid that existed there since the first of the year 1912.

I arrived in Fort Dodge on the evening of November 2d and the follow-

ing morning held a conference with Drs. Carrington and Mulroney. The afternoon was spent in an inspection of the principal dairies supplying milk to the people of Fort Dodge and investigating sanitary conditions about town.

On Monday, November 4th, I got my laboratory apparatus installed and the remainder of my time was spent principally in investigating the conditions surrounding the water supply at Fort Dodge.

Prior to my arrival, Dr. Carrington had collected statistics on over eighty cases of typhoid, and, inasmuch as there is no law in Iowa making the reporting of typhoid cases compulsory, it is due to his work and the kindly assistance of Dr. Mulroney and the other physicians that we had this data to form the basis of our epidemiological investigations.

The main facts shown by these statistics are as follows:

I. In fifty-one out of the eighty cases the patient drank the city water exclusively. In eighteen cases the city water was used in conjunction with some other supply, well, spring, etc., and in but five cases did the patients say that they had not used the city water, and at least one of these cases can be traced to direct contact.

II. The cases, with respect to age, are shown by the following table:

Age.	Cases.	Age.	Cases.
1-10 years	14	30-40 years	8
10-20 years	18	40-50 years	5
20-30 years	23		

It will be seen by these figures that age plays little or no part in the selection of these cases, but that the disease is pretty evenly distributed among the susceptible ages.

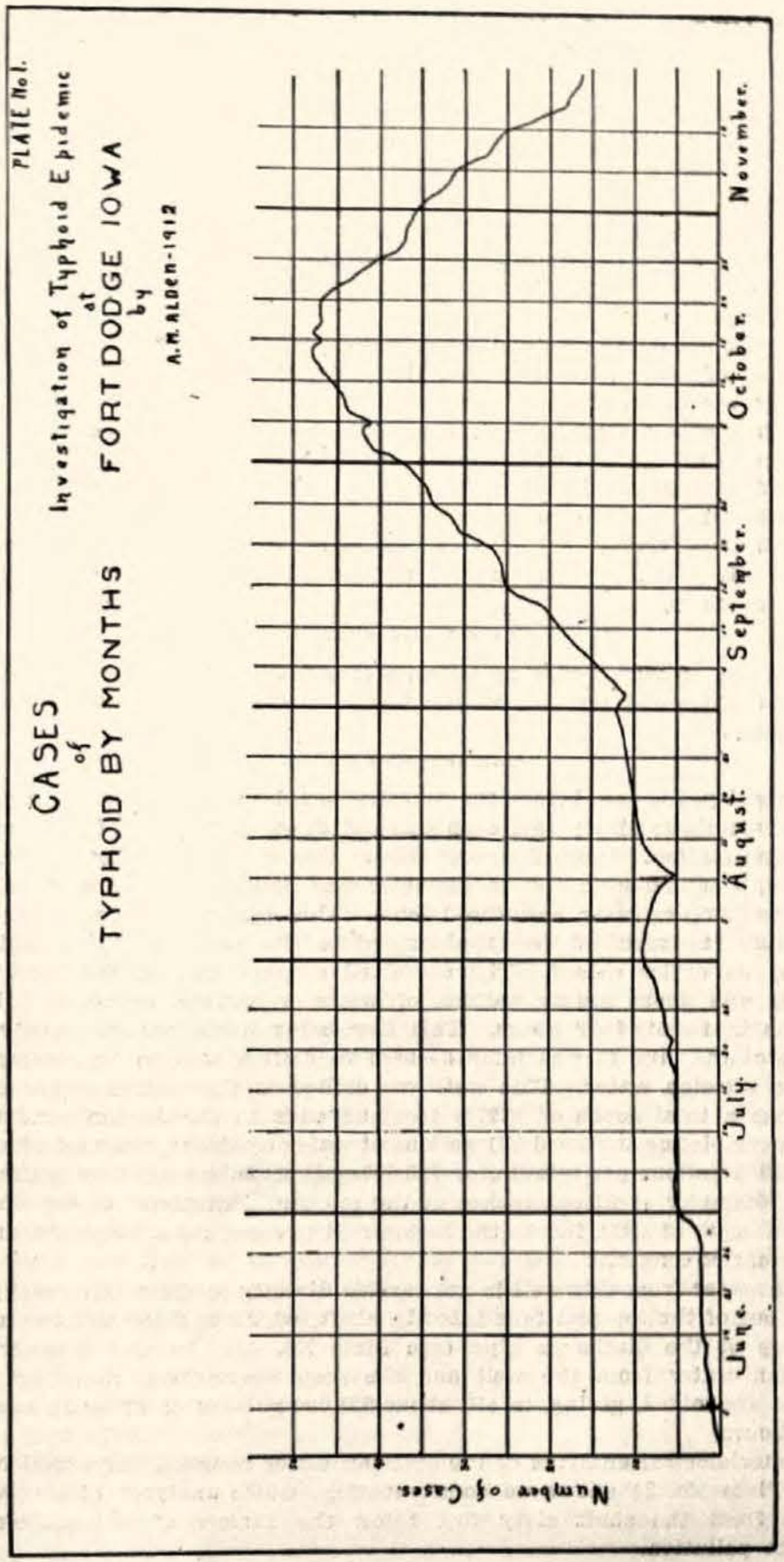
III. The chart on the following page will show that the epidemic had no sudden onset, but that typhoid had been prevalent for at least six months, and, although we have no data earlier than January 1st, we have been told by physicians that at no time for over two years has Fort Dodge been entirely free from typhoid. It will be seen, however, that in September and October, immediately after the hot months, the time when the organisms would multiply with greatest rapidity in water, the number of cases takes a sudden rise, and a large per cent of the cases occurring at this time were those which used the city water as their sole supply.

October 14th the hypochlorite treatment of the water was instituted and, allowing twelve days as the normal period of incubation, there were only two cases that developed after October 26th, and both of those can be traced to contact.

IV. That the epidemic has been one of less than ordinary virulence is shown by the fact that since January 1, 1912, there have been only about five deaths from the total number of cases and complications, such as hemorrhage or perforation, have been very few.

MILK.

An inspection of the principal dairies supplying milk to the people of Fort Dodge shows that all of them had fairly sanitary surroundings and that they all cooled the milk immediately after milking and kept it below 50° F. until time of delivery.



The typhoid cases are about evenly distributed among the dairies, no one of them having a preponderance of cases among their customers.

CONCLUSIONS FROM THE ABOVE DATA.

The epidemic has all of the characteristics of a water-borne infection.

1. It affects all susceptible ages uniformly; whereas, in a milk-borne infection, a much larger percentage of cases is to be found among babies and young children.

2. The low death rate and percentage of complications show it to be an infection of lower virulence than the majority of those carried by milk have proven to be. This is due to the fact that water, as compared with milk, furnishes a very poor culture media for the typhoid organism.

Since in all but five of the cases the chief source of water supply was taken from that furnished by the city, therefore, the city supply was the probable carrier of the infection.

With these conclusions in view, we made an exhaustive investigation of the city water system, sources and distribution, and ascertained the following facts.

CITY WATER SYSTEM.

The city of Fort Dodge gets its water supply from two sources—three artesian wells and the Des Moines river. These sources I shall consider separately.

THE ARTESIAN WELLS.

Several years ago, before the artesian supply was thought of, a 10x10 foot shaft about ninety feet deep was put down just north of the present pumping station. From the west side of this shaft, a few feet above the bottom, a tunnel nine feet in diameter was driven, extending out under the Des Moines river and the Island. This tunnel was driven in the limestone, so required few timbers, while the shaft was timbered for almost its entire extent. The combined seepage flow of the shaft and tunnel was about eighty gallons of water a minute, or about 115,000 gallons in twenty-four hours. This flow being inadequate to supply the needs of the city, it was later decided to drill a well in an attempt to secure artesian water. This well was drilled in the bottom of the shaft and has a total depth of 1827.5 feet and ends in the Jordan sandstone. At its completion it flowed 571 gallons of water a minute, but now supplies about 500 gallons per minute, or 720,000 gallons in twenty-four hours. It has a diameter of fifteen inches at the top and a diameter of five inches from a depth of 1,421 feet to the bottom. It is cased for a large proportion of its entire length.

The water from this well is not carried directly to the mixing well, but flows out of the top and falls into the shaft, which is filled with water to the top of the discharge pipe (see Plate No. 4). In this manner the artesian water from the well and the seep water from the shaft and tunnel are mixed, giving, in all, about 835,000 gallons of water in twenty-four hours.

Bacteriological analyses of the artesian water supplied from well No. 1 (see Plate No. 3) shows no contamination, while analyses of the water taken from the shaft sixty feet below the surface show considerable sewage pollution.

The pollution of the water from the shaft and tunnel is accounted for by the fact that all of the rocks between the bottom of the Des Moines river and the tunnel are easily permeable and permit the seepage of the river water into the sides of the shaft and tunnel. The amount of pollution carried by the river at this point is greatly enhanced by the fact that Soldier Creek, a source of great contamination, owing to the fact that it gets the surface drainage from the entire north part of the city, empties into the river just above the sight of the tunnel (see Plate No. 2). (Analysis of the water from Soldier Creek is shown on Plate 3.) This means that the water from well No. 1, while pure when it comes from the pipe, is delivered to the mixing well in a contaminated condition, owing to the fact that it is already mixed with the seepage water from the shaft and tunnel.

Since 1908 two additional wells have been drilled for city supply. Well No. 2, which is located about a hundred feet north of well No. 1, has a depth of 670 feet, and a diameter of 20 inches at the top and 13.5 inches at the bottom. It is a flowing well and discharges 150 gallons of water a minute. Well No. 3 is located about 1,000 feet northeast of the other wells. It is 215 feet deep, has a diameter of eight inches, and flows 600 gallons a minute. The combined flow of the wells in March, 1912, was reported at more than 1,500,000 gallons in twenty-four hours. Analyses of the water from these two wells appear on Plate 3.

THE DES MOINES RIVER.

The city of Fort Dodge uses something over 1,500,000 gallons of water in the twenty-four hours, and over 1,000,000 gallons of this is used during the day, so, inasmuch as during this time the combined flow of the wells is only about 750,000 gallons, it is necessary during the day to add water from the Des Moines river to make up the deficit, so about 25% of the water that goes into the mains comes from the Des Moines river. This is obtained by sinking a series of pipes four feet under the bottom of the river, just north of the island and above the mouth of Soldier Creek. The water from these pipes goes into two large, bricked-up collecting wells located on the island. From here it is conveyed by gravity to the mixing well in the pumphouse, where it is thoroughly mixed with water from the three artesian wells and taken out by a suction pipe from the pump.

Bacteriological analyses of the river water (see Chart No. 3) show that it is contaminated, and this contamination has been, up until the institution of the hypochlorite plant, pumped, unchanged, into the pipes. The fact of there being much more typhoid in the south part of town than in the north part may be accounted for by the fact that the pipes in the north part of town were systematically flushed during the warm months, while those on the south side were not. This allowed the pollution to collect in the pipes.

The sample of water taken from the pressure tank showed great pollution, and this was probably a potent factor in the contamination of the water that went to the south side of the city.

The samples of water taken from the Oleson park tap and the tap at the Plymouth Gypsum Mill, to the water from both of which we were able to trace several cases of typhoid, showed a high degree of contamination,

although the samples were taken two weeks after the hypochlorite treatment was instituted. This is due to the fact that the water from neither of these places had been used lately and the pipes had not been flushed so as to permit the entrance of the treated water. This has since been done.

Owing to the fact that a wrong impression has been created in the minds of the people by the previous reports of analyses of water from Fort Dodge made at the state bacteriological laboratory, which had been worded, "No typhoid found, but B. coli present," we deemed it advisable to actually show the presence of the typhoid organism in the water, so, by the use of Conradi-Drigalski and Russel media, we were able to isolate a strain of B. typhosus. This was agglutinated against the blood of three patients who had the disease so as to definitely establish its identity.

Samples of water taken from representative parts of town (Nos. 10, 12 and 14 on Plate 3) show little or no contamination. This is probably due to the hypochlorite treatment, which is still being used, and, although it is not rendering the water sterile, it greatly cuts down the bacterial content.

GENERAL SANITARY CONDITIONS.

Although there is a city ordinance in Fort Dodge compelling people to connect their premises with sewers, and making the abolition of open privies compulsory, this has not, up until this time, been enforced, and there are hundreds of privies scattered over the city. These are, for the most part, of the surface variety and completely open, allowing free access to flies, rats, chickens, etc.

The alleys are decorated in many places with large manure piles, which furnish places where flies may breed by millions.

Just above the pumping station there is an area of ground covering about an acre and lying just on the bank of the river which has for years been the place for the deposition of countless loads of manure, garbage and general rubbish. In the rainy season the washings from this go directly into the river, though, in all probability, little of it reaches the city mains, because of a small island which deflects the current from this place away from the intake pipes.

In many parts of the city the people are using shallow wells, which permit the entrance of surface drainage and consequent pollution.

In front of many grocery stores fresh vegetables are exposed, unscreened from flies and unprotected from dust from the streets, dogs, etc.

The spitting ordinance is not enforced.

RECOMMENDATIONS.

The following recommendations are respectfully submitted:

I. Make the city water supply safe. This, I think, will be accomplished when the new reservoir is finished and the total flow of the three artesian wells can be utilized. This reservoir is to have a capacity of about 200,000 gallons, and, inasmuch as the wells are to be directly connected with it, the water that at present goes to waste during the night will be saved and utilized during the day time. This reservoir will also act as a sedimentation basin and permit the water to rid itself of a large part of the hydrogen sulphide that it now contains.

This supply will be adequate for the present, but with the growth of the city a source furnishing a much larger amount of water must be found, and there are only two ways out of this difficulty:

First—To drill more artesian wells, which will probably not be desirable on account of the fact that the chemical composition of the artesian water makes it unsuitable for commercial purposes, and that probably the amount of water furnished by the wells will gradually diminish. There has been, even now, some appreciable diminution in the daily flow.

Second—To put in a modern filtration and sedimentation plant and utilize the water from the Des Moines river. This could be obtained at a place some distance above the city and, by this method, rendered safe for domestic purposes.

The hypochlorite treatment of the water should be continued until systematic analyses of the water show that it is no longer necessary.

All dead ends of pipes and terminal taps should be thoroughly flushed at least once a month in summer and once in two months in winter, so as to prevent the collection of sediment in the mains.

II. It is recommended that all parties living within reasonable distance of the sewers be forced to connect their premises with same, and that surface privies be torn down.

Those people who, on account of their location, cannot connect with the sewers, should be made to put in closed cans in their privies, and these cans should be thoroughly cleaned out once a month.

III. All garbage and other refuse material should be regularly and systematically disposed of and no pile of manure be allowed to remain in any place longer than a week, as these furnish breeding places for flies, which are dangerous to the health of the community.

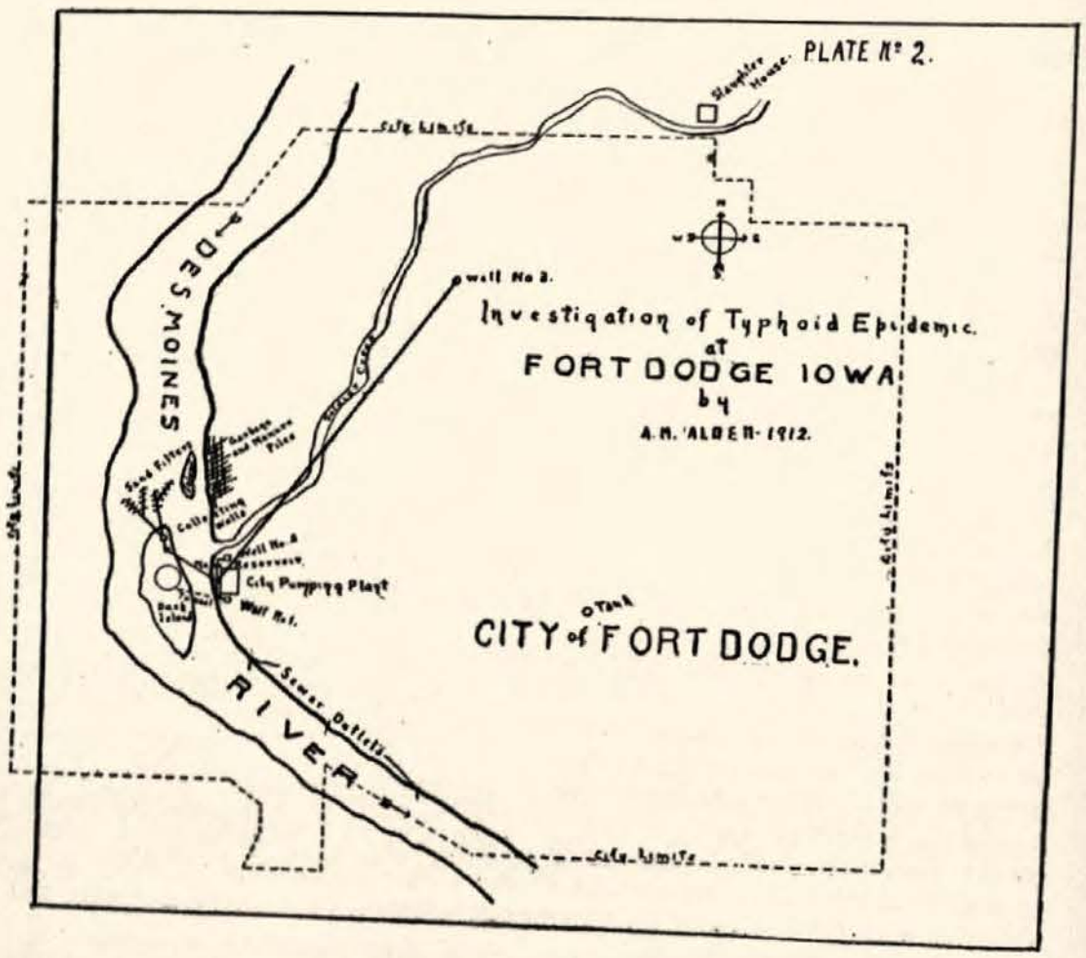
IV. The use of ice harvested from the Des Moines river at any point below the mouth of Lizard creek should be prohibited, as analyses of the water show that it is unfit for use and the organism of typhoid may live for months in ice. This ice is dangerous and should not be used, even for cooling purposes.

V. It is strongly urged that the city of Fort Dodge establish a modern health department, and that a competent man be found to take charge of this work, and that he be furnished with adequate laboratory facilities and authority to properly carry on this work. By this I do not mean that the present health officer is inefficient or incapable, for, considering the tremendous handicap under which he has worked, he has accomplished a great deal. Although he has given considerable time and thought to this work, it is advisable, on account of the enormous amount of work to be done in a city the size of Fort Dodge, to employ a man who can give his whole time to this position.

VI. An ordinance should be passed making the reporting of all cases of communicable diseases compulsory.

In conclusion, I wish to thank you, your city health officer, Dr. Mulroney, Mr. Pray, the water superintendent, and the physicians of the city for their kindly encouragement and assistance in this work, without which it would have been impossible to have arrived at any definite conclusions. I also wish to thank Dr. Carrington for the use of the epidemiological data gathered by him, and his valuable co-operation and

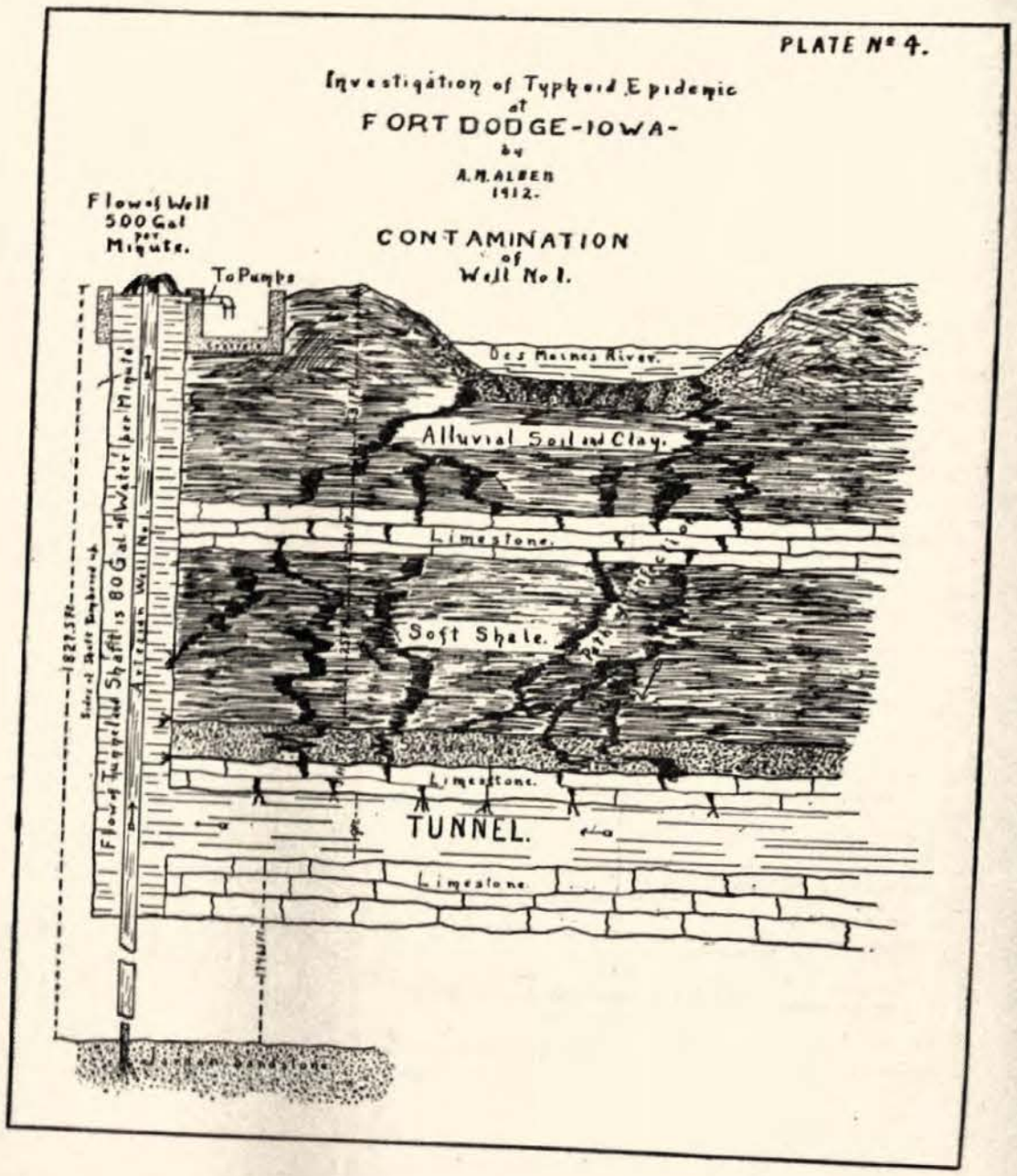
advice in my work, and Professor Kay, of the geological department of the state university, for the information given us in regard to the geological conditions surrounding the city of Fort Dodge.



Analyses of Water.

	Source of Sample	Date of Examination. Planting	Number of colonies on plain* agar	Number of red colonies on Litmus lactose agar	Gas produced in Lactose Bile		
					1cc	1cc	2cc
		Plates and fermentation tubes counted 48 hours, after incubation at 37° C.					
1	Well No. 1 Shaft 60 feet below surface	Nov. 4	196	2			
2	Soldier Creek	"	468	Myriads		10%	30%
3	Des Moines River below the mouth of Soldier Creek	"	213	40		5%	20%
4	Oleson Park Tap	Nov. 5	114	Myriads		10%	55%
5	Plymouth Mill Tap	"	82	"		6%	40%
6	Des Moines River above the mouth of Soldier Creek	"	119	11			
7	Wash water from tank	Nov. 7	48	Myriads		20%	30%
8	Well No. 1	"					
9	Well No. 2	"					
10	Tap in First National Bank building	"	38	4			
11	Des Moines River below creamery	Nov. 9	147	141			30%
12	Fountain at Court House	"	33				30%
13	Well No. 3	"					
14	Wahkonsa Hotel Tap	"	24				

*These plates were made of a dilusion of 1-1000.



REPORT ON THE INVESTIGATION OF THE EPIDEMIC OF DIPHTHERIA AT NEWTON.

BY A. M. ALDEN.

Dr. G. H. Sumner, Secretary-Executive,
State Board of Health,
Des Moines, Iowa.

Dear Doctor Sumner:

In accordance with your instructions through Dr. Albert, I went to Newton, Iowa, arriving there April 28th at 10 o'clock. I immediately had a conference with Mayor Beard and ascertained the following facts relative to the diphtheria situation in Newton:

First, between October 28, 1913, and April 4, 1914, there were only five cases of diphtheria in Newton. These were not limited to any particular school, locality or class of individuals, but were, seemingly, "sporadic," or "accidental contact" cases. There were, however, several other cases outside the city limits in the outlying districts. There were two deaths among these town cases.

Second, from May 9th to May 27th of this year, fourteen families were quarantined in town and in several instances there was more than one case in the family. About this time a case developed in the family of Mr. E. H. Hanky, who lives just outside the corporate limits of Newton, and who has been selling from thirty to forty gallons of milk daily in Newton.

Third, a large per cent of the cases have been released from quarantine without cultures having been taken, either from the patient or the other members of the family. This was particularly true in the case of the Hanky family. The case in this family died about the middle of May, and three days after this the house was fumigated and the family released without any cultural examinations having been made.

Fourth, immunizing doses of antitoxin to the exposed members of a family in which there was diphtheria were given in very few cases.

Fifth, about May 22d, the state dairy commissioner came down to Newton and, after looking over Mr. Hanky's dairy, pronounced it in an unsanitary condition and closed it.

Sixth, it is the opinion of a large part of the people in Newton that Hanky's milk was the infecting agent in the cases that developed late in May.

Due to the fact that the dairy was closed, it was impossible for me to get a representative sample of the milk in question. However, cultures were taken from the throat and nose of each of the released members of the Hanky family. Out of these four cultures all yielded positive results, showing that the members of the family still carried diphtheria bacilli in their throats. Cultures were also taken from all the released members of the various families in which there had been diphtheria. By referring to table No. 2, you will see that out of the twenty-two cultures taken, twelve gave positive results, showing the necessity for cultural release of all members of a quarantined family.

I have made arrangements to have sent to Mayor Beard a copy of the report of each diphtheria examination from Newton, so that he may at all times know just what the status of the epidemic really is. I believe they will be able to handle the situation successfully from now on and that the course of the outbreak will soon be stopped. He has assured me that in the future all sore throats will be watched carefully and diagnosis cultures sent in from all suspicious cases. Also that no case of diphtheria will be released without two consecutive negative cultures being taken from both nose and throat of the affected person. Also that the quarantine will not be raised from a house until a negative report has been received from this laboratory on a culture taken from each of the exposed members of the family.

CONCLUSIONS.

First, that cases of diphtheria released when the membrane disappears and the throat looks well, but without the precaution of taking cultures, often are dangerous and may be instrumental in spreading the infection among other people.

Second, that at least one negative culture should be obtained from all members of a household where there is or has been diphtheria before they are released from quarantine.

Third, that an immunizing dose of antitoxin should be given all members of a family where there is diphtheria.

Fourth, that though in all probability the released members of the Hanky family were instrumental in spreading the infection, the milk was not infected because he sold a large amount of milk (over 125 quarts daily) and diphtheria appeared in only eight families using this milk. Had the milk contained diphtheria bacilli, there would have been many more cases, and a large per cent of these cases would have been among small children, who are the greatest consumers of milk, whereas, the cases were evenly distributed as to age.

CASES OF DIPHTHERIA FROM OCTOBER, 1913, TO MAY 27, 1914.

FAMILY	QUARANTINE	RELEASED	Used Hanky's Milk
O. P. Meyers	Oct. 28, 1913	Nov. 13	No
Harry Stratton	Nov. 10, 1913	Dec. 1	No
Mona Robinson	Nov. 23, 1913	Dec. 5	No
Arthur Jackson	Feb. 6, 1914	March 3	No
Geo. D. Davis	March 22, 1914	Died 30th	Yes
Sam Goldberg	April 4, 1914	Died April 4	Yes
Clements	May 9, 1914	May 21	No
James Quinlan	May 13, 1914	May 26	No
Earl Runyan	May 20, 1914	Not released	Yes
Chas. Kiljon	May 22, 1914	Not released	No
Mrs. O'Halleran	May 25, 1914	Died 25—28	Yes
Burl Owens	May 24, 1914	Not released	Yes
O. H. McClan	May 25, 1914	Not released	Yes
Mrs. L. Lowery	May 25, 1914	Not released	Yes
Fred Kloppen	May 25, 1914	Not released	Yes
Dr. Jas. T. Hill	May 26, 1914	Not released	No
J. C. Shepard	May 26, 1914	Not released	No
Mrs. Ch. Malmbar	May 26, 1914	Not released	Yes
Ole Nelson	May 26, 1914	Not released	Yes
R. O. Johnson	May 27, 1914	Not released	No

RESULTS OF CULTURES TAKEN FROM EXPOSED MEMBERS OF RELEASED FAMILIES.

No.	Name	Exposed	Antitoxin	-or-
1	Sam Goldberg	Yes	None	—
13	Libby Goldberg	Yes	1,000	+
15	Mrs. Goldberg	Yes	None	+
2	C. H. McClean	Yes	None	—
3	Fred Klaffing	Yes	None	—
4	James Quinlan	Recovered	5,000	+
5	Partia Quinlan	Exposed	None	—
10	Mrs. Quinlan	Yes	None	—
6	Mrs. Geo. Davis	Yes	None	+
7	Catherine Davis	Yes	None	+
8	Harriet Davis	Yes	None	+
9	Mr. Davis	Yes	5,000	+
11	Floy Hanky	Yes	None	+
12	E. H. Hanky	Yes	1,000	+
16	Alvin Hanky	?	None	—
14	Joe White	?	None	—
17	Juanita Weaver	?	None	+
18	Mary Weaver	Yes	None	—
19	Mr. Weaver	Yes	None	—
20	Vern Meredith	?	None	—
21	Herman Miller	Yes	None	+
22	Earl Runyon			

THE TREATMENT OF DIPHTHERIA CARRIERS.*

HENRY ALBERT, M. D., PROFESSOR OF PATHOLOGY AND BACTERIOLOGY, UNIVERSITY OF IOWA; DIRECTOR OF THE BACTERIOLOGICAL LABORATORY, IOWA STATE BOARD OF HEALTH, IOWA CITY, IOWA.

In this paper I shall consider the treatment of diphtheria carriers with the idea of ridding them of the specific germs. The paper will not comprehend the treatment of the diphtheria patient, nor will it deal with the problem of isolating or otherwise protecting others from the carrier.[1]

The necessity for the treatment of carriers with the idea of getting rid of the diphtheria bacilli is obvious when we consider the frequency of the carrier condition and the length of time that the condition often continues. After the clinical symptoms of the disease have disappeared, the patient is ready to be released from quarantine, but the interests of the public health demand that he shall not mingle with the general public while he still carries the germs of the disease.

NUMBER OF DIPHTHERIA CARRIERS.

According to Ledingham,[2] 50 per cent of persons affected by diphtheria have lost the bacilli by the time the local membrane has disappeared. Of those harboring diphtheria bacilli after the throat had become healthy

*Read in the Section on Preventive Medicine and Public Health of the American Medical Association, at the Sixty-Fourth Annual Session held at Minneapolis, June, 1913.

[1]The principles concerned with the protection of others from the carriers are considered in an article by Albert, Henry: Diphtheria Carriers and Their Relationship to Medical Inspection of Schools. Am. Jour. Pub. Health, ii, No. 10.

[2]Ledingham and Arkwright: The Carrier Problem in Infectious Diseases, 1912, p. 203.

in appearance, Scheller[3] found that 77 per cent still had the bacilli at the 50 per cent of patients who still have diphtheria bacilli after the throat end of eleven days after the throat had become normal in appearance; 35 per cent at the end of twenty-one days; 18 per cent at the end of thirty-one days; 5 per cent at the end of two months, and 2 per cent at the end of three months. Considering that these figures apply only to the has become clear, it means that if we took as a basis the total number of cases of diphtheria, the percentage figures would be only one-half those given. My own figures are slightly different.[4] I found that of all cases of diphtheria, 41 per cent were free from diphtheria bacilli by the end of the second week after the beginning of the disease; 73 per cent at the end of the third week, and 99 per cent at the end of the fourth week.

Of the general population who have not been affected by the disease, 1 or 2 per cent, under ordinary conditions, and from 5 to 10 per cent during epidemics of the disease are "carriers" of the germs. They retain the bacilli for about the same length of time, on an average, as convalescents from the disease.

VIRULENCE OF BACILLI IN CARRIERS.

The virulence of the diphtheria bacilli seems to be but slightly lessened during the carrier condition, even though the condition persists for a long time and is completely lost (as determined by the ordinary tests) in only a small portion of the cases. It is, therefore, quite obvious that with but few exceptions a carrier can transmit the disease as long as the carrier condition remains. It is also probable that the carriers are responsible for more cases of the disease than are those affected by the disease itself. This certainly seems to be the case if we include among the carriers those with slight evidence of local inflammation, but presenting no obvious general symptoms and whose condition is not diagnosed clinically as diphtheria.

LOCATION OF THE BACILLI IN THE CARRIER.

In general, we may say that the nose and throat are the places in which the diphtheria bacilli are to be found. On that basis, the release from quarantine for diphtheria is based, almost the country over, on negative findings of swabbings from the nose and throat. Swabbings taken from both and cultivated separately indicate that, when dealing with well persons, the bacilli are found more frequently in the nose than in the throat.[5] These findings are the results of surface swabbing. The result will probably be different, if the swab, instead of being used on the surface of the tonsils, is introduced into the crypts of those structures.

It seems improbable that the diphtheria bacilli will remain and continue to grow for any great length of time on the rather smooth mucous membrane which covers the greater part of the nose and throat; rather do I believe that their home is in little pockets here and there from

[3]Scheller: Centralbl. f. Bakteriol., Orig., 1906, xl, 1.
[4]Albert, Henry: Diphtheria; A Statistical Study of Certain Laboratory and Clinical Observations. Jour. Infect. Dis., 1907, iv, 210.
[5]Report on Diphtheria Bacilli in Well Persons, by a committee of the Massachusetts Association of Boards of Health, Jour. Massachusetts Assn. of Boards of Health, July, 1902.

which there is not a sufficient stream of mucus to dislodge them. Such pockets may be represented by the crypts of the tonsils, the fissures of the adenoids, the spaces about the turbinates, and the sinuses connected with the nasal cavity.

The finding by Beyer[6] of diphtheria bacilli in the urine in every one of nineteen children examined from four to fourteen weeks after they had apparently recovered from diphtheria should cause further investigations of this phase of the subject. If his report is generally confirmed, it will have an important bearing on public health, especially with reference to milk.

METHODS OF RIDDING CARRIERS OF THE BACTERIA.

Many methods have been used to get rid of diphtheria bacilli. These have consisted of liquid antiseptics applied with cotton, sprayed or gargled; inhalations of antiseptic vapors; use of diphtheria vaccine, toxin, antitoxic and antibacillary serum, toxins of the *Bacillus pyocyaneus*, and finally the use of cultures of staphylococci.

1. *Use of Liquid Antiseptics Applied by Means of a Cotton Swab.*—These are applied, of course, only to the throat (tonsils and pharynx). They consist of such liquid antiseptics as a weak solution of phenol (carbolic acid), glycerin, with 3 per cent iodin, and 5 per cent solutions of silver nitrate. As ordinarily performed, the antiseptics are applied only to the exposed surfaces of the throat, no effort being made to get into the crypts of the tonsils. I shall refer to these later.

2. *Use of Liquid Antiseptics Applied by Means of a Spray.*—These may be applied to both nose and throat. The following fluids have been used with greatest success: Seiler's solution; Dobell's solution; hydrogen peroxid of 0.5 per cent (by weight) strength. Any of these solutions are found to be too irritating for many persons.

It is probable that sprays are more efficacious than liquids applied by means of a swab in the ordinary way. Nevertheless, sprays do not reach the recesses in which it is most probable that diphtheria bacilli find their hiding-places.

3. *Use of Liquid Antiseptics Applied by Means of Gargles.*—These are probably more effective for the throat than either swab applications or sprays. The liquid that has probably given the best results is hydrogen peroxid in from 0.5 to 1 per cent strength (the ordinary commercial hydrogen peroxid solutions are of about 3 per cent strength). Solutions of sodium chlorid and Seiler's solution have also been used. The liquid used as a gargle may also be used as a mouth-wash.

4. *Inhalations of Antiseptic Vapors.*—The following method was used by the French army, in 1910, for the disinfection of the nasopharynx: A mixture is prepared of iodin, 12 gm.; guaiacol, 2 gm.; thymol, 25 gm., and alcohol (60 per cent), 200 c.c., to which are added 6 gm. of potassium iodid to aid in the dissolving of the iodin. This mixture is placed in a porcelain dish and the dish floated in a basin of boiling water. The person whose nasopharynx is to be disinfected should sit with head bent over and nose a few inches distant from the porcelain dish, and inhale

[6]Beyer, W.: Diphtheria Bacilli in the Urine, Munchen, med. Wchnschr., 1913, lx, No. 5.

the fumes by breathing slowly through each nostril. There should be five sittings in twenty-four hours, each sitting to last two or three minutes. I have not yet seen any statistical data of the effect of this inhalation treatment on diphtheria carriers. This and other inhalations are worthy of much more extensive trial.

5. *Diphtheria Antitoxin.*—The use of antitoxin administered either by hypodermic injection or by the dissolving of tablets in the mouth seems to have no effect in getting rid of the bacilli.

6. *Antibacillary Diphtheria Serum.*—Some good results have been reported from the use of antibacillary diphtheria serum applied locally. The evidence of its value is, however, very unsatisfactory.

7. *Diphtheria Vaccine.*—Vaccines of dead diphtheria bacilli were first used with the view of curing the carrier condition by Petruschky[7] in 1908. Five of his six cases seemed to respond favorably to the treatment. Similar results suggesting that vaccines are of some value were obtained by Hall and Williamson[8] in 1911 and by Forbes, Duncan and Newsholme[9] in 1912.

8. *Diphtheria Toxin.*—Hewlett and Nankivell[10] report a reduction in the time that diphtheria bacilli can be found in the nose and throat after an attack of the disease by the hypodermic injection of diphtheria endotoxin, beginning with a dose of 2 mg., followed at the end of a week or ten days, if necessary, with an injection of 5 mg.

9. *Staphylococcic Culture (Living) Sprayed into Nose and Throat.*—In December, 1909, Schiötz,[11] a Danish physician, described a method of freeing the throats from diphtheria bacilli which seems destined to be a procedure of considerable importance. It has proved successful in about forty reported cases in which other measures failed, and so far no unfavorable results have been reported. Schiötz obtained his suggestion from the fact that a person with a staphylococcic sore throat placed in a diphtheria ward under a mistaken diagnosis did not contract diphtheria. He also found that the germs disappeared on the development of an ordinary staphylococcic sore throat, from several patients in whom, after recovery from diphtheria, the specific bacilli persisted for some time. He reported the treatment of six cases with the staphylococcic culture obtained from the throat of a healthy person. The diphtheria bacilli disappeared after one inoculation of the throat of a man who had been detained in the hospital for three months as a diphtheria carrier, and of a woman who had likewise been detained for two months. The other patients who had had diphtheria more recently recovered from the carrier condition with equal rapidity after one treatment with staphylococci. More recently Page[12] tested the method with equal success. Catlin, Scott

[7]Petruschky: Arb. a. d. path., Inst. z. Tubingen, 1908, vi, Part 2, p. 331.
[8]Hall and Williamson: Jour. Path. and Bacteriol., 1911, xv, 350.
[9]Forbes, Duncan and Newsholme: Lancet, London, 1912, i, 292.
[10]Hewlett and Nankivell: Treatment of Diphtheria Infection by Means of Diphtheria Endotoxin, Lancet, London, July 20, ii, No. 4638.
[11]Schiotz: Uskadeliggereke af Infektionsbaere ved Difteri, Ugesk. f. Laeger, Copenhagen, Dec. 16, 1909, No. 50; abstr., The Journal A. M. A., Jan. 29, 1910, p. 422.
[12]Page H.; Diphtheria Bacillus Carriers, Arch. Int. Med., January, 1911, p. 16.

and Day[13] tried the staphylococcus spray on carriers in connection with an epidemic of diphtheria which occurred at the Rockford (Ill.) hospital. Of seventy persons, 17 per cent developed diphtheria and 31 per cent became carriers. In spite of liquid antiseptic treatment, some of them continued to remain carriers for a long time, but the bacilli soon disappeared after the use of the staphylococcus spray. Lorenz and Ravenel[14] also report good results in a few cases. Alden[15] of our laboratory reports good results in fifteen out of sixteen cases. The material used was a broth-culture of the *Staphylococcus pyogenes aureus* which was originally obtained from a throat culture submitted for examination for diphtheria bacilli. The inoculated broth tube was kept in the incubator at 37 C. (98.6 F.) for eighteen hours. The treatment consisted of sprays of the living staphylococci into the nose and throat. Treatments were given once a day until the patients were free from diphtheria bacilli.

Lydia Dewitt[16] in making an experimental investigation of this method of treatment was unable to determine to what influence the good effects are due. There is apparently no antagonism between the two organisms.

Aside from the occurrence of slight negligible reactions, the literature contains no reported cases of harmful effects produced by the use of the staphylococcus spray. I desire to report one case of this kind, which occurred in the practice of Dr. J. E. Luckey of, Vinton, Iowa, with a culture supplied by us. He reports:

"We used the culture of staphylococci in two cases. Our first case responded beautifully, the bacilli disappearing in a few days. The second case cleared readily of the Klebs-Loeffler bacilli, but the reaction, consisting of local inflammation with nausea, chills, high fever and rapid pulse, was so great that we desire to be excused from its use in the future."

The development of this severe condition may, of course, be a coincidence.

10. *Extirpation of the Tonsils when Markedly Enlarged and Removal of Adenoids.*—These conditions alone are indications for the operative procedures mentioned. The continuance of the diphtheria-carrier condition represents a further indication. On account of the wound produced, it is advisable to give an immunizing dose of diphtheria antitoxin before the operation, as cases of severe diphtheria in carriers following such operations have been reported.

AUTHOR'S EXPERIENCE AND EXPERIMENTS AS TO THE PRESENCE OF THE DIPHTHERIA CARRIERS IN THE CRYPTS OF THE TONSILS.

Discovery of the Crypts of the Tonsils as the Hiding Place of Diphtheria Bacilli.—During the spring of 1911 a number of cases of diphtheria occurred among the nurses and patients of the University Hospital at

[13]Catlin, Scott and Day: Successful Use of the Staphylococcus Spray on Diphtheria Carriers, The Journal A. M. A., Oct. 28, 1911, p. 1452.
[14]Lorenz, W. F., and Ravenel, M. P.: The Treatment of Diphtheria Carriers by Overriding with Staphylococcus Aureus, The Journal A. M. A., Aug. 31, 1912, p. 690.
[15]Alden, A. M.: The Staphylococcus-Spray Treatment of Diphtheria Carriers, The Journal A. M. A., June 14, 1913, p. 1876.
[16]Dewitt, Lydia: Action of Staphylococcus Aureus on the Klebs-Loeffler Bacillus, Jour. Infect. Dis., January, 1912, abstr., The Journal A. M. A., Feb. 3, 1912, p. 369.

Iowa City. As it was suspected that some of the nurses or other employes of the hospital were diphtheria carriers, an examination was made of the nose and throat of every employe in the hospital, with the result that twenty-two of them (20 per cent of the entire number) proved to be carriers. These were placed in isolation, the nose treated with an alkaline antiseptic spray and the throat gargled with a 1 per cent solution of hydrogen peroxid. The desire for the inmates to be released from isolation as soon as possible caused eight of them to use a hydrogen peroxid gargle within fifteen minutes of the time that the culture was to be taken. The person who took the culture was apprised of this fact and consequently took two swabbings from each throat, one from the surface of the tonsils and pharynx and one from the crypts of the tonsils. In all but three of these cases, cultures from the surface swabbing did not contain any diphtheria bacilli, whereas, in every instance but one, cultures from the tonsillar crypts were positive. This indicated that so far as the throat is concerned, the crypts of the tonsils are the hiding-places for diphtheria bacilli.

Other Evidence Implicating the Tonsillar Crypts in Connection with the Carrier Condition.—Aside from the observation just noted, which I have noticed on a number of occasions subsequently, I may mention that:

1. The tonsils seem to be the logical place in which diphtheria bacilli should remain, in view of the fact that they are the parts most often primarily affected by diphtheria.

2. The surface being smooth and having mucus, saliva, etc., passing over it more or less constantly does not seem to be a favorable place for diphtheria bacilli to remain and multiply unless, of course, a membrane has formed. On the other hand, diphtheria bacilli, or any other bacteria that have once gained entrance to the larger crypts, some of which are more than a centimeter in depth, find it a place in which they are but little disturbed, lined as these crypts are by squamous epithelium and not giving origin to any secretion or excretion to sweep the contained bacteria out, as occurs in connection with the ducts of glands.

3. Those who have had extensive experience with diphtheria-bacilli carriers report that a large proportion of them (considerably larger than among those who are not carriers) have enlarged tonsils with prominent crypt openings and deep crypts.

4. By squeezing the tonsils and forcing "plugs" of material out of the crypts, Kretschmer[17] has succeeded in freeing thirteen patients from the carrier condition on whom the more simple measures failed.

5. Treatment aimed at destroying the bacteria in the tonsillar crypts has proved successful in ridding diphtheria carriers of the contained bacteria. Although silver nitrate has long been used to treat inflammatory conditions of the throat, its use for treating diphtheria carriers, whether there was naked-eye evidence of tonsilitis or not, was first used, so far as I know, by Dr. L. W. Dean of Iowa City. He tried it first on the University hospital employes in 1911. The carriers in question had been treated from three to ten days with antiseptic sprays and gargles, during which time only two of twenty-two carriers became negative. Of the

[17]Kretschmer M.: Zur Bekampfung der Bacillenpersistenz bei Diphtheriere-konvaleszenten, Med. Klin. 1911, vii, No. 3.

remainder, fourteen had the crypts of their tonsils treated with silver nitrate. Of the cultures taken twenty-four hours later, ten were negative. The remaining four became negative within three days. A number of physicians to whom I have recommended this treatment have informed me that this method has yielded better results than any other method tried, including the staphylococcic culture method (Luckey).

Method of Applying the Silver Nitrate.—A 5 or 10 per cent solution is used and should be made up with distilled water and kept in a dark-colored bottle or a dark place to prevent deterioration. This solution is applied by means of applicators made of metal which may be bent readily as copper and are long enough (about 11 inches) to admit of convenient handling. The end which is to be inserted into the crypts must be small (about 0.75 mm. in diameter) and roughened in order to hold cotton. Around this end is tightly wrapped a very small amount of cotton—only a few fibers, so that the cotton-wrapped applicator measures less than a millimeter in diameter. This is bent about a centimeter from the end so that the angle formed is a little more than 90 degrees. It is then dipped in the silver nitrate solution. All excess of the solution should, however, be removed by pressing the cotton against the inner side of the neck of the bottle. This is important since the excess may trickle down the throat to the glottis of the larynx, where the reaction induced may prove serious. With the tongue well pressed down, the crypts should be probed, preferably, from below upward, since the slight amount of silver nitrate which may not enter the crypt tends to flow down and the whitening produced tends to obscure the openings of crypts below. The openings of the larger and, therefore, most important crypts are easily found and entered. To find the smaller ones it is often necessary to run the end of the applicator gently over the surface of the tonsil until it finds a depression. Several of the smaller ones may be probed without redipping the applicator into the nitrate solution. For the larger ones it is best to redip each time. If the cotton-wound probe is too thick, it will not readily enter the crypts. In that case the applicator without cotton will often pass in easily. Without the cotton, however, it is impossible to introduce sufficient of the nitrate solution, unless, possibly, the applicator is sufficiently roughened just back of the tip to "hold" a little fluid.

The Effect of Silver Nitrate Applications.—Bacteriologic: The 5 per cent solution of silver nitrate will destroy all bacteria with which it comes in contact. I have been unable to obtain a culture from many crypts that were thoroughly treated with silver nitrate from which I had just previously obtained cultures of the diphtheria bacillus and other organisms. This, then, is one way in which this treatment of the crypts gets rid of diphtheria bacilli.

Pathologic: The silver nitrate solution (from 10 to 40 per cent), if thoroughly applied, will destroy the lining epithelium of the crypts. If not thoroughly applied, the deeper epithelial cells are not destroyed. In any case, there is an inflammatory reaction, the degree depending on the strength and amount of the solution. I have tried solutions up to 40 per cent. Although the stronger solutions produce more destruction of tissue and are, therefore, better, if that is what is desired, yet the reaction

induced is often too severe. I believe, therefore, that the weaker solutions (from 5 to 10 per cent) are the better. Microscopically, the reaction consists principally of a hyperemia, a leukocytic exudation and a proliferation of fibroblasts.

The pathologic changes induced are probably of benefit in two ways:

1. The destruction of the epithelium of the crypts and the accompanying fibroblastic proliferation tends, no doubt, to obliterate the lumen of the crypt, which is quite obviously desirable.

2. The greater number and activity of the leukocytes renders greater phagocytosis possible, and the hyperemia brings to the area the antitoxic, bacteriolytic and opsonic properties of the blood. It is quite probable that the good effect of staphylococcic cultures is due to the induction of a similar reaction.

Clinical: My experience has assured me that the application of a solution of silver nitrate to the crypts of the tonsils is efficacious in ridding diphtheria carriers of the specific micro-organism. I believe that its use is more efficacious and less dangerous than the use of the staphylococcic culture; in other words, I believe it to be the best single remedy which we have.

CONCLUSIONS.

1. The length of time during which patients who have had diphtheria continue to carry diphtheria bacilli in the nose and throat after all clinical evidence of the disease has disappeared, and the frequency with which diphtheria carriers are found among persons who have never had the disease, renders it important in the interest of both the individuals and the public health to rid carriers of the specific organisms as quickly as possible.

2. It is obvious from the large number of methods proposed for the removal of diphtheria bacilli from diphtheria carriers that no one method has proved satisfactory.

3. The use of the various antiseptics, gargled or sprayed, is of doubtful value in relieving the carrier condition, although they, no doubt, destroy many of the germs with which they come in contact, and, therefore, lessen the infectivity of the carrier.

4. During the past few years good results have been obtained by myself and a number of other observers, by the use of a spray of a culture of staphylococci.

5. I have obtained my best results by the treatment of the crypts of the tonsils with a solution of silver nitrate (from 5 to 10 per cent) applied by means of a thin flexible applicator, combined with a mild alkaline and antiseptic spray (such as Seiler's solution) for the nasal cavity, and a 1 per cent solution of hydrogen peroxid as a mouth-wash and gargle.

6. There is great need of applying the different methods of treatment aiming at ridding diphtheria carriers of the specific micro-organisms in a well-controlled manner in a large series of cases.

7. If it is found that diphtheria bacilli are frequently found in the urine of convalescents, more attention should be given to the hygienic aspects connected with this condition.

"I desire to acknowledge the courtesy of Dr. L. W. Dean, of Iowa City, in supplying me with tonsils treated with solution of silver nitrate of different strength at varying lengths of time preceding their removal."

ABSTRACT OF DISCUSSION.

DR. L. L. TEN BROECK, Minneapolis: The application of antiseptics to tonsillar crypts is an advancement over methods previously employed; it is also an acknowledgment of its shortcomings, to wit, the difficulty of controlling the entire infected area. Reports based on cultural control alone may be misleading, since the areas accessible to culture are necessarily limited to areas accessible to antiseptic application. It is the inacessible areas and crypts that justify such methods as those of Schiötz (staphylococcus) or Emmerich (pyocyanase). The use of facultative pathogens, especially on raw surfaces in acute stages, is open to criticism, for postdiphtheritic staphylococcus infiltrations are not unknown. Furthermore, the bactericidal action of an organism is not demonstrated by spraying it copiously on a diphtheritic field, even if culture on mediums supporting well the growth of the sprayed organism subsequently fails to develop colonies of *Bacillus diphtheriae*. To illustrate, Dr. Corbett, city bacteriologist, found nothing but streptococci in a postdiphtritic otitis medium. Dilute phenol irrigations, however, inhibited this growth and permitted pure cultures of *B. diphtheriae*. Subsequent mixed inoculations gave streptococci only. Given a medium supporting the *B. diphtheriae*, and not its antagonist, grow the two together on mediums suitable to both and one has an absolute test of the bactericidal properties of the antagonist. For example, here is a broth culture (exhibiting the same) of *B. diphtheriae* to which on the second day were added a thallophytic fungus (genus *Saprolegnia*) and human blood (since the fungus grows only on human blood so far as ordinary culture mediums are concerned, not on Loeffler's mediums). Subcultures the third day on Loeffler's, likewise the fourth day (that is, from the inoculation with *B. diphtheriae*) are negative, as you see, in these tubes. Clinical tests have been made on normal throats, in twenty-five cases of follicular tonsilitis and in fifty cases of membranous tonsilitis without complications traceable to the fungus and with disappearance of the diphtheria germ in about seventy-two hours in cases controlled bacteriologically. A few patients have made a clinical and bacteriologic recovery following inoculation with the fungus alone without other medication. This (exhibiting specimen) is a diphtheritic cast of a uvula removed without recurrence sixty-eight hours after diagnosis and inoculation with the fungus, cultures remaining positive for three days only. Four membranes have been removed from four diphtheritic patients and inoculated on normal throats about twelve hours after use of fungus on patients. A slight faucial congestion negative for diphtheria was all that was noted, the thallophyte apparently growing to the exclusion of other contagion. Perhaps it will be possible to compel the patient to transmit the prevention as well as the contagion, even at this early stage. The dispensing is simple—a powder, kept in vials, consisting of spores lactose (a diluent) and blood on which it is grown and from which it is filtered. These statements are based on results that are at present undergoing critical review in the University

of Minnesota. A report will be forthcoming as soon as they are substantiated.

Dr. Henry Albert, Iowa City, Iowa: Were cultures made after forty-eight hours following the use of the spores?

Dr. L. L. Ten Broeck, Minneapolis. Yes; cultures were made up to four days. The test has been repeated with a number of strains.

Dr. Harold B. Wood, Rochester, Minn.: Just because the diphtheria bacilli finally give way to staphylococci in the throat is no specific reason why only the staphylococci themselves should be used as overriders. After Ravenel put that theoretic transference into the practical experience of using the staphylococci as overriders to eliminate the diphtheria bacilli, all, or practically all, the experimenters seemed to be using the same organism. That organism is well known to be a facultative pathogen. Some other organism which can not damage the human body would, perhaps, be the more ideal organism to use in overriding.

I have one report which is so brief that no conclusions can be drawn from it; however, it may be of interest. At Rochester we have recently (this year) been using the lactic acid bacillus as an overrider. Four cases of diphtheria appeared in the state insane hospital. The cases had absolutely no direct connection one with another; but it was found that they had an indirect connection with a certain kitchen. Cultures were made from all of the help of that kitchen and one woman, who had never had any symptoms of diphtheria, was found to be the carrier. Her throat was swabbed and sprayed with various antiseptics of different strengths, and repeatedly, for six weeks, gave positive cultures. Then, at the suggestion of Dr. A. H. Sanford, bacteriologist to the Mayo Clinic, the lactic acid bacillus spray was used. The lactic acid bacillus is harmless, undoubtedly, to human beings; it is easily obtained, and is a rapid grower. This spray was used for several days, and then, two weeks after that, the woman was examined for the first time and gave negative cultures. About three weeks ago our next cases of diphtheria appeared. Four patients were given antitoxin, their throats swabbed out with tincture of iodin, and no effect obtained in neutralizing the diphtheria growth. Three sprayings were given each person within thirty-six hours, and every subsequent culture was negative. One case was especially severe: *A young man came from South Dakota* with a well-advanced case of diphtheria. His entire pharynx was blocked with membrane, and within thirty-six hours he was given twenty-eight thousand units, with no effect except to check the increase of the membrane. His throat was swabbed with pure tincture of iodin a number of times without effect; but after being sprayed with the lactic acid bacillus three times within thirty-six hours the membrane showed rapid decrease, and within three days it had entirely disappeared. Before the spraying, all the cultures had been positive; after the spraying all were negative. These results are simply suggestive, but are offered that the plan may be carried out by others who have greater opportunity for work. There is one practical point in this connection: If a country physician finds a case of diphtheria and if he is without antitoxin or antiseptics, it would do no harm, and might do good, to flush the nasal cavity and the throat thoroughly with ordinary sour milk.

Dr. D. L. Richardson, Providence R. I.: We have tried all kinds of solutions in the treatment of diphtheria-carriers with about the usual results. We have used silver nitrate solution, staphylococcus spray, iodin, iodin and glycerin, peroxid of hydrogen and bichlorid of mercury as applications to the fauces, to the throat, to the nasopharynx and to the nose, and we have come to the conclusion that cases should be left alone for a certain period of time, no applications being used except some mild solutions when there is a marked nasal discharge. After a certain period, if the cultures continue to be positive, we generally make application of tincture of iodin or of iodin and glycerin. If this, however, proves of no value, we have for eighteen months removed adenoids and tonsils. This latter is, judging from our own experience, a most efficacious method of getting rid of diphtheria bacilli in persistent carriers. Once in a while, we will fail, but I think less frequently than with any other method of treatment. Remember that in getting rid of the foci of infection, the adenoid tissue and tonsils, we have removed the deep infection which local applications could not reach. Then, if overriding with staphylococcus spray is, theoretically or practically, of any value, by the operation you have infected the throat with the organisms resident in that throat. Whether it is this or the removal of the adenoids and tonsils that rids the throat of the different organisms, I am not sure. I do know that in England they are removing adenoids and tonsils for this purpose. After operation and until discharge, there is little danger of the throats picking up other organisms, whether diphtheritic or otherwise; but it is our custom to quarantine all such cases so long as the throat shows any active inflammatory result after the operation or until the patient is discharged.

Dr. C. Hampson Jones, Baltimore: In Baltimore we have tried to solve this question, not only in the use of all kinds of antiseptics, but also in trying to determine whether or not it is necessary to use anything to clear up the throat.

Drs. W. L. Moss and Guthrie, of the Johns Hopkins Hospital, carried out a series of experiments during the past twelve or eighteen months. I know that from fifty positive throats that were followed day after day and week after week there were absolutely no cases of disease produced. . . . Exactly what it means we do not know. Of course, Dr. Moss and Dr. Guthrie and others have worked out the strictly scientific end of it, so far as the bacteriology is concerned, and no doubt their report will be found of great interest.

There is one method of clearing up the throat not mentioned today that might be of service somewhere, that is the use of iodin. The iodin we use is known as Boulton's solution of the national formulary—a combination of phenol (carbolic acid) and iodin—which clears up the throat wonderfully well; but the preliminary spraying of the throat with cocain and going over the throat with the finger, pressing out the crypts, not only of the tonsils, but also of the pharynx, will make the subsequent application of Boulton's solution much more effective, because it seems then to get into the crypts.

DR. M. P. RAVENEL, Madison, Wis.: Dr. Jones has brought up an entirely new point of view. Several years ago I recommended that spongy and enlarged tonsils should be massaged. We use the true ivory spatula for this purpose; the finger would do just as well. In cases in which the spray did not act well, massage of the tonsil and use of the spray a second time cleared up the condition in practically every instance, without any trouble. Dr. Jones has brought out another point, namely, the non-contagiousness of the disease in some of these diphtheria-carriers; but what about the condition of the carriers themselves?

Dr. Lawrence and myself have used the staphylococci spray for treatment. It is an excellent method, except in carriers; but we are going to try it next winter early in the case, more exclusively with reference to the treatment of the disease.

DR. E. F. OTIS, Penuelas, Porto Rico: We are on the right track when we do not treat these tonsils too vigorously with too strong an antiseptic solution. My practice has been to use a very strong alkaline sodium bicarbonate, combined in a normal saline solution, and thus cut away all mucus; and then I use healing oils that are not too strong. I find that this method does not seem to set up an irritating reaction.

DR. HENRY ALBERT, Iowa City, Iowa: The number of methods that have been discussed emphasizes one of the conclusions that we made; namely, that no one method has as yet proved satisfactory for the proper treatment of the carrier condition.

Reprinted from The Journal of the American Medical Association
Sept. 27, 1913, Part 1, Vol. LXI, pp. 1027-1031.

American Medical Association, 535 N. Dearborn St., Chicago.

THE STAPHYLOCOCCUS-SPRAY TREATMENT OF DIPHTHERIA CARRIERS.

A. M. ALDEN, A. M., ASSISTANT DIRECTOR OF THE BACTERIOLOGIC LABORATORY OF THE IOWA STATE BOARD OF HEALTH, IOWA CITY, IOWA.

The presence of diphtheria bacilli in the throats and nasal passages of patients convalescing from the disease long after all clinical symptoms have disappeared constitutes one of the most prolific sources of infection the health officer has to deal with in combating this disease. Just what the average period of persistence in virulent cases of diphtheria is it is hard to say. Graham Smith and Cobbett's[1] tables give it as 31.6 days and estimate that one-third of the cases exceed this time. Our experience, however, has been that according to the cultural method the average period of persistence in Iowa is about sixteen days. Henry Albert[2] says:

"Unfortunately, however, there are some in whom the bacteria remain so persistently that they can still be found for from five to seven weeks, in one of our cases for seven weeks and in one case on record for twenty-three weeks after clinical recovery from the disease. Another condition

[1]Nuttall, G. H. F., and Smith, G. S. Graham: The Bacteriology of Diphtheria, 1908, p. 421.
[2]Albert, Henry: Diphtheria Carriers, Am. Jour. Pub. Health, ii, No. 10

which has been the subject of considerable study in recent years has been the presence of diphtheria bacilli in the throats of persons who are not, nor, so far as known, have ever been affected by diphtheria. These diphtheria bacilli carriers are of most frequent occurrence when diphtheria is prevalent in a community. Fortunately the bacilli living under such conditions are frequently of low virulence and in some instances have lost their disease-producing power entirely. On the other hand, their virulence is often of full strength and even though they may not produce any disease in the carrier, when transferred to other persons, they may produce the disease in its most virulent form. It is very certain that diphtheria has been kept alive for months in institutions and communities by such carriers. Indeed, it is quite probable that carriers with either a normal throat or a slightly 'sore' throat are the source of more cares of diphtheria than persons affected by well-marked cases of the disease."

A ruling of the state board of health in Iowa provides that before a diphtheria patient can be released from quarantine, two consecutive negative reports must be obtained from the state laboratory on cultures taken from both nose and throat. During the last twelve months we have had a number of cases the cultures from which remained consistently positive after the normal period of persistence and after all manner of local treatment had been used. Following the reports of Schiötz,[3] Page,[4] Catlin, Scott and Day,[5] Lorenz and Ravenel[6] and others[7] who had successfully used the staphylococcus spray in such cases, we decided to use it in all cases from which the cultures remained positive after four weeks.

The culture used was a composite one made by mixing equal portions of three different strains of *Staphylococcus pyogenes aureus*, isolated from throat-cultures. These were grown on agar and afterward transferred to broth. The material sent out was 30 c.c. of an eighteen-hour broth culture grown at 37.5 C. (99.5 F.). This was sent in a cylindrical bottle, the top of which was closed with a rubber cap and sealed with paraffin. Several sterile rubber caps were sent with each bottle.

The following set of instructions was also enclosed with each bottle of the culture sent out:

---

[3]Schiotz, A.: Uskadeliggereke af Infektionsbaere ved Difteri, Ugesk. f. Laeger, Dec. 16, 1909; abstr., The Journal A. M. A., Jan. 29, 1910, p. 422.

[4]Page, Henry: Diphtheria Bacillus-Carriers, Arch. Int. Med., January, 1911, p. 16.

[5]Catlin, S. R., Scott, L. O., and Day, D. W.: Successful Use of the Staphylococcus Spray on Diphtheria Carriers, The Journal A. M. A., Oct. 28, 1911, p. 1452.

[6]Lorenz, W. F., and Ravenel, M. P.: The Treatment of Diphtheria Carriers by Overriding with Staphylococcus Aureus, The Journal A. M. A., Aug. 31, 1912, p. 690.

[7]Slack, F. H., Arms, B. L., Wade, E. M., and Blanchard, W. S.: Diphtheria Bacillus-Carriers in the Public Schools, The Journal, A. M. A., March 19, 1910, p. 951. Kretschmer, M.: Zur Bekampfung der Bazillenpersistenz bei Diphtherierekonvaleszenten, Med. Klin., 1911, vii, No. 3. Lydia, Dewitt: Jour. Infect. Dis., January, 1912.

"DIRECTIONS FOR USE OF STAPHYLOCOCCUS CULTURE.

"The enclosed bottle contains a broth-culture of *Staphylococcus pyogenes aureus* and should be used in the following manner:

"Remove paraffin and rubber cap and pour a portion of the culture (enough for one treatment) into an atomizer, the bottle and application tubes of which have been sterilized by boiling for ten minutes. Spray the throat and nasal passages well."

Note.—1. One of the enclosed rubber caps should be replaced on the bottle immediately after using so as to prevent contamination. 2. The culture should be kept in a cool dark place. 3. Care should be taken not to get any of the culture on skin of the patient, and if this happens the area should be thoroughly cleansed with alcohol. 4. Treatment should be given at least once a day. 5. The first culture should be made twenty-four hours after the first and before the second treatment. Subsequent cultures should be made at intervals of twenty-four hours until two consecutive negative reports are obtained from the laboratory.

In order to secure some statistics as to the real value of the treatment, we also enclosed a blank data card which we asked the doctor to fill out and mail back to the laboratory after the patient was released from quarantine.

The accompanying table gives a summary of the results obtained in the first sixteen cases:

SUMMARY OF RESULTS IN SIXTEEN CASES IN WHICH STAPHYLOCOCCUS SPRAY WAS USED TO FREE PATIENTS OF DIPHTHERIA BACILLUS.

Case No.	Ill and a Carrier, Days	Antitoxin Received, Units	Other Methods Used	No of Treatments	Days Required for 1st Neg. Culture	Complications Due to Staphylococcus
1	29	15,000	Antiseptic spray	4	3	Slight edema of face
2	22	1,000	Alkaline antiseptic	5	3	Chronic nasal catarrh temporarily worse
3	58	17,500	Gargle	5	2	None
4	33	10,000	Mercuric chlorid spray	2	2	None
5	33	1,000	Pot. chlorate, hydrogen peroxid	4	4	None
6	36	3,000	Antiseptic gargle	2	2	Sore throat; slight fever
7	35	8,000	Antiseptic gargle	2	2	Sore throat; malaise
8	28	10,000	Hydrogen peroxid, glycerin and tanic acid	3	2	Slight redness of throat
9	28	5,000	Pot. permanganate spray	4	5	Pharyngitis
10	44	5,000	Silver nitrate swab	4	4	None
11	*	None	Silver nitrate, 10 per cent.	9	7	Slight fever; nasal catarrh increased
12	40	5,000	10 per cent. ferric chlorid	12	8	None
13	21	5,000	Alkaline gargle	3	1	None
14	33	15,000	3 per cent. phenol spray	4	2	None
15	28	5,000	Hydrogen peroxid	5	3	Headache
16	29	20,000	Silver nitrate, 10 per cent.	13	†	Goiter somewhat increased in size

*Never had the disease but was exposed and gave positive cultures from August 29 to September 13.
†Released by virulence test.

In these cases all but three patients had carried the organism of diphtheria constantly for at least a month, and in one case the time of persistence was eight weeks. During this time, notwithstanding the fact that all manner of local antiseptic and astringent treatment was used, the patients continued to give positive cultures. This can be accounted for by the fact that in cases of this kind the organisms are usually in the deep tonsillar crypts which often become plugged, thus preventing the local application from reaching the organism. The antiseptic condition produced remains for only a few minutes because the excess of the agent used is carried out by the secretions. With the staphylococcus spray the effect seems to be different; whether or not this is due to some antagonistic action of the products produced by the organisms themselves it is impossible to say at this time.

In all but one of these cases the patient gave a negative culture within a week after the use of the staphylococcus spray was begun, and in the majority of the cases only a few applications were needed to free the throat from *Bacillus diphtheriae*. In one case this remedy failed absolutely and the patient was released by a negative virulence test. Possibly this failure was due to the culture having become inactive or to defective application. The fact remains that in all but one of the cases it was effective.

When this remedy was first introduced there seemed to be a general reluctance on the part of physicians to use it on account of the danger of introducing the live organisms into the throat and the consequent possibilities of such serious complications as otitis media, mastoiditis, etc. This fear seems unwarranted in view of the fact that it has now been tried in upward of forty reported cases and no serious results have been reported in a single patient.

Below I am giving the history of two typical cases showing the course of the disease and the effects of this treatment.

REPORT OF CASES.

CASE 1.—A farmer, aged 21, came to office November 2, complaining that his throat had been very sore for a week. Examination showed membrane covering entire back of throat. The cervical lymph-nodes were enlarged and tender. The only constitutional symptoms were headache and slight malaise.

November 2: Culture showed large numbers of *B. diphtheriae*.
November 5: Five thousand units of antitoxin given.
November 6. Five thousand units of antitoxin given.
November 22: Culture positive; all symptoms had disappeared.
November 23, 26, 27 and 29: Culture positive.
November 30: Culture negative.
December 4: Culture positive.
December 7: Culture positive; staphylococcus spray used.
December 8: Culture negative; staphylococcus spray used.
December 9: Culture negative; staphylococcus spray used.

No constitutional symptoms followed the use of the staphylococcus spray. The throat was red and slightly swollen for one day.

Local applications of hydrogen peroxid, and glycerin and tannic acid were used in throat and nose during the duration of the disease and of the carrier condition.

CASE 2.—A boy, aged 13, developed a typical case of diphtheria. July 21, which ran as follows:

July 21: Culture positive.
July 24: Five thousand units of antitoxin given.
July 25: Seven thousand five hundred units of antitoxin given.
July 31: Membrane disappeared and patient was apparently well.
August 7, 10, 17 and 23: Culture positive.
August 25: Five thousand units of antitoxin given.
August 29: Culture positive.
September 3: Culture negative.
September 6: Culture positive.
September 10, 11 and 12: Staphylococcus spray used.
September 13 and 14: Culture negative.

There were no constitutional or local symptoms traceable to use of the spray.

It will be seen that each of these patients developed a typical carrier condition. In each case the membrane disappeared and all clinical signs and symptoms of the disease were stopped shortly after the antitoxin was given; notwithstanding the fact, however, that the patients seemed perfectly well, their throats continued to give positive cultures for several weeks. In each case there is one negative report on a culture after which the reports were again positive. This may be due to the local antiseptic treatment having been used shortly before the culture was taken, or to carelessness on the part of the physician in taking the culture. In neither case did it require more than three treatments with staphylococcus culture before a negative culture was obtained.

CONCLUSIONS.

In view of all these facts I think that the following conclusions are warranted:

1. No patient having had diphtheria should be released from quarantine until at least two consecutive negative cultures are obtained from both nose and throat, and ear if symptoms are present.

2. Antitoxin will not free the patient from the carrier condition, but some local application is necessary to rid the throat and nasal passages of *B. diphtheriae*.

3. In fifteen out of sixteen cases the staphylococcus spray effectively cleared the throat of *B. diphtheriae* after other methods had failed.

4. Apparently no harm resulted to the patient from the use of the spray.

PERIOD OF INCUBATION OF DIPHTHERIA CULTURE.

(A study made to determine whether or not it is worth while to make examinations of cultures at 9 o'clock p. m. after an incubation of twelve hours.)

HENRY ALBERT, M. D., IOWA CITY, IOWA.

Read before The Laboratory Section, American Public Health Association, Colorado Springs, September, 1913.

The need of giving a report on diphtheria cultures as quickly as possible is appreciated by all. Although a five to eight-hour period of incubation is frequently all that is necessary to secure a sufficient growth of diphtheria bacilli so as to be able to give a positive diagnosis, there are many cultures that require a twelve to fifteen-hour incubation, and, as shown by Slack and Arms at the 1908 meeting of this section, re-incubation and re-inoculation of typical diphtheria cultures incubated for fifteen hours is often desirable.

When the examining staff is limited to such size that only one examination of a culture can be made, I think it may be said that a twelve to fifteen-hour period of incubation should preferably be chosen. Such a rule can be much more readily carried out in city laboratories which receive most of their cultures late in the afternoon than in state laboratories which receive most of their cultures early in the morning. Thus about 90 per cent of the cultures which reach the state laboratory in Iowa are received before 9 o'clock in the morning. They are immediately entered on our record book and placed in the incubator. The tubes are given a naked-eye inspection at 5 o'clock in the evening. Those that present evidence of growth are examined microscopically at that time; the remainder, and also those examined microscopically, in which the growth was not sufficient, or in which suspicious forms were found, are placed back in the incubator and examined the following morning.

During the warm months, *i. e.*, from about June 15th to September 1st, we find that it is possible to make the final microscopical examination late in the afternoon of the same day that the specimens are received, in about 90 per cent of the cases. Indeed, about 75 per cent present a visible growth at the time they arrive at the laboratory.

During the colder months, however, we find that very few present a growth at the time they are received, and that only about 16 per cent present a visible growth late in the afternoon of the day they are received, *i. e.*, after an incubation of about eight hours.

The purpose of the investigation on which this paper is based was to determine whether or not it was worth while to examine our diphtheria cultures at 9 o'clock in the evening, *i. e.*, after a twelve-hour incubation, in order that a report might be sent out by the night mail which may reach any part of the state the following morning. Accordingly, a large part of the diphtheria cultures received during the months of March, April

and May, 1913, were examined at 5 o'clock, and again at 9 o'clock, of the day they were received, and at 8:30 the following morning. A microscopic examination was made of every culture at each of the three times, whether there was a visible (to the naked eye) growth or not.

The results of these examinations are presented in the following table:

RESULT OF EXAMINATIONS OF DIPHTHERIA CULTURES AFTER DIFFERENT PERIODS OF INCUBATION.

When Examined (1913)	Number Examinations	5:00 p. m. 8 hrs. incub.			9:00 p. m. 12 hrs. incub.			24 hrs. incub. 8:30 a. m.			Per cent of positives first found at 9:00 p. m.
		Pos.	Neg.	*	Pos.	Neg.	*	Neg.	Pos.	*	
March	44	3	5	36	5	9	30	11	26	7	18%
April	548	20	62	466	64	149	335	229	304	15	19%
May	262	21	28	213	42	68	152	143	103	16	14%
Total	854	44	95	715	111	226	517	383	433	38	18%

*No or insufficient growth; suspicious forms, etc.

The last column gives the percentage of the total number of positives which were first discovered at the 9 o'clock p. m. examination. The temperature conditions, as far as the growing of diphtheria cultures are concerned, for the month of April are about the same as during the colder months, since the temperature of the postoffices and mail cars is kept up by artificial heat.

It appears, therefore, that during the colder months, *i. e.*, from October to June, 12 per cent of the culture that ultimately prove to be positive can be diagnosed correctly after an eight-hour period of incubation, and that 30 per cent of the cultures that ultimately proved to be positive can be diagnosed correctly after a twelve-hour period of incubation. This means that 18 per cent could be diagnosed as positive for the first time only after a twelve-hour period of incubation.

CONCLUSIONS.

1. By making examination of diphtheria cultures at 9 o'clock p. m., reports on 18 per cent of the specimens which eventually prove to be positive will be received by the attending physician twelve to twenty-four hours earlier than when the examination is left until the following morning.

2. As a result of these examinations we have adopted the following scheme for the examination of all diphtheria cultures received at our laboratory in the morning during the colder months of the year:

A. Place all cultures in the incubator immediately on receipt.

B. Inspect all the cultures at 5 o'clock p. m. and make a microscopic examination of all that present a growth visible to the naked eye. Those which are positive may, of course, be reported upon immediately. Those which are not positive should be returned to the incubator.

C. Repeat the procedure as outlined under "B" at 9 o'clock p. m.

D. Make microscopic examination of all cultures not reported on before early the following morning.

In conclusion, I desire to acknowledge the assistance of Mr. A. M. Alden and Mr. H. E. Harlow, rendered in the making of the examinations.

THREE IMPORTANT SUBJECTS.

RABIES—HYDROPHOBIA.

RABIES is a disease of animals and of man. The dog seems to be most subject to it. For many years it was maintained that it was comparatively rare in this country, but recent studies have shown that it is anything but rare. In a registration area, consisting of ten states, there were, during the five years from 1900 to 1904, two hundred authenticated cases of hydrophobia. In the District of Columbia during the six months ending July 1, 1908, sixty-eight animals were attacked by it, and for the seven years from 1893 to 1900 twenty-eight persons suffered from this disease. This seems a large tax to which we willingly submit in order that the dog may enjoy privileges not allowed to other animals.

Rabies, or hydrophobia, prevails at all seasons and is about as frequent in winter as in summer. Not every dog infected runs wild on the streets foaming at the mouth, for in not a few instances the animal seems but slightly sick and is only a little restless. These cases are very dangerous, as their owners are liable to caress the animal at such times and become infected.

The most important step in the prevention of this disease is to have all dogs muzzled whenever they are on the public streets, no matter whether they are in the leash—tie string—or not. This is quite common in foreign countries—Europe—and in every case where it has been done the disease has practically disappeared. Some of our people will object, on sentimental grounds, to the use of muzzles, but it is necessary, and if properly fitted the dog is not injured in the least and will be saved from many a bite from his fellows.

A dog the least bit sick should be watched with great care lest he be suffering from this disease. If there is the slightest suspicion about a dog which has bitten a person, the Iowa State Board of Health Laboratory at the State University, Dr. Henry Albert, director, should be consulted, and under his advice the dog may be killed and its head sent to the laboratory where it can be examined. Persons who have been bitten should receive the Pasteur treatment immediately. The expense ought to be charged against the person owning the dog, and, should he be unable to pay, the public should furnish the funds. This is sound teaching from an economical as well as from a sanitary standpoint, and will tend to reduce the number of unmuzzled dogs to the minimum. A community which does

not properly protect its citizens should pay for any damages they sustain from lack of such protection.

RATS—DISEASE PRODUCERS.

Rats are not desirable inhabitants of the home or of the barn. They destroy an immense quantity of grain and other valuable produce, besides eggs and young chickens. Rats which live at the slaughterhouse feed on the refuse and become infected with parasitic diseases, especially trichinosis. These are in turn transmitted to hogs which devour the dead rats about the slaughterhouse, then people eat the pork and thereby contract a parasitic disease.

Rats suffer extensively from plague, and the infected fleas which are found in their bodies are the means of transmitting, or of transferring, the disease to man. Plague is practically unknown in the United States, but it has had a footing in San Francisco and New Orleans, and in the former city for over nine years, and has gradually extended its territory, resisting the efforts of the sanitary authorities of that city and the state of California. It is epidemic in many of the ports of South America. Once it is established in a country, it is eradicated with difficulty, and its ravages are something appalling, especially where there is an extensive population that is ignorant and careless of sanitary precautions. In India the mortality from plague during the year 1905 was 878,602. It is not at all improbable that it may gain a footing in some of our eastern or southern cities. Should such a thing happen, the plague—the dreaded disease in the oriental countries of Europe and the far East—may reach Iowa through the transportation of rats, and the man would be indeed well off whose premises are free from these pests. Rats are an abomination at any rate, and the people of Iowa should begin a campaign against them until all are completely exterminated, thereby making diseases which they convey impossible. It should be called to mind here that there is in existence the Leper Rat as well as the Plague Rat.

Rats may be excluded from the house by closing up all holes, especially those around the sewer and water pipes, and by blocking up the space between the plastering and the walls. The cellar floor should be laid in cement and every means possible used to exclude rats from all dwellings. Corn cribs and similar buildings may be made rat proof by covering the walls and floor with stout wire netting, which is strong enough to resist the teeth of the animal. The usual method of placing an inverted tin pan upon the top of each post upon which the building rests frequently fails, because the rat can jump from the pole to some hole in the floor of the building.

Rats may be destroyed by trapping, fumigating, poisoning, and by use of certain germs which are deadly to rodents—knawing animals—but harmless to man. Ferrets are also useful. In India it has been learned that where there are many rats, cats are employed, and with the extermination of rats plague is very rare, because these cats keep away the rats and apparently do not suffer from the disease.

It should be remembered that plague is also transmitted to ground squirrels, and should plague be introduced into Iowa through the agency of rats, then the disease is sure to be conveyed to our people. As a final warning the Iowa State Board of Health sounds the warning for all the people to begin an extermination of the rat and thereby prevent the dreaded plague from securing a foothold in our fair state.

MAY WE HAVE IDEAL COUNTRY SCHOOLS.

The Iowa state board of health is interested in the country schools of Iowa, for it is in these rural institutions of learning that the brainy and brawny children are reared.

High ideals in sanitary requirements for these country schools are proposed in a bulletin that is distributed through the United States Bureau of Education. The bulletin comes from the joint committee on health problems in education, composed of members of the National Educational Association and the American Medical Association.

The general ideal proposed is that "the country school should be as sanitary and wholesome in essential particulars as the best home in the community."

"The school should be located in a beautiful place," declares the committee. "Noise should be eliminated; children should not be obliged to walk farther than two miles, or ride more than six; play-grounds should be ample and well drained; and the school grounds should include a real garden or experimental farm, with trees and plants grouped artistically."

The schoolhouse, according to the bulletin, should be as nearly fireproof as possible. Doors should open outward. A small room for consultations and emergency purposes, and one for workshop, instruction in cooking and preparing refreshments, should be provided.

In the matter of ventilation and heating, the bulletin gives specific suggestions. "Fresh air should be provided through window board ventilators, except where the furnace or jacketed stove is used, in which case adequate inlets and outlets should be provided. Every school should have a thermometer, and temperature in cold weather should be between 66° and 68° F."

Light should be abundant. "The best arrangement," says the bulletin, "is to have the light come only from the left side of the pupil and from the long wall of the classroom. The schoolroom should receive direct sunlight sometime during the day, but the main windows should not face directly south. East or west facing is desirable. In providing shades for windows, dark ones should be used at the top to control light on bright days."

"There should be no dry sweeping or dusting," says the committee. "Floors and furniture should be cleaned with damp sweepers and oily cloths. Scrubbing, sunning, and airing, are far better than any form of fumigation."

The common drinking cup should not be tolerated. Care should be taken that drinking water always comes from a safe source; drinking fountains, located just inside or outside the schoolhouse, with sufficient pressure for running water, should be provided. That "water for wash-

ing should be easily accessible and should be utilized always after using the toilet and before eating seems little enough to ask, but many schools are found to be lacking in this respect."

The bulletin speaks at length upon sanitary toilets. If there is no water system, separate closets for boys and girls should be at least fifty feet from the schoolhouse in different directions.

Copies of the full set of requirements may be had free by writing to the commissioner of education, Washington, D. C. County superintendents of schools and boards of education may obtain a sufficient number to supply all their teachers and school officers.

GUILFORD H. SUMNER,
Secretary.

REPORT OF THE CIVIL AND SANITARY ENGINEER FOR THE YEAR ENDING JUNE 30, 1914.

BY PROF. LAFAYETTE HIGGINS, ENGINEER MEMBER OF THE BOARD.

Field Investigations—

(a) Sanitary surveys relating to water supply, sewerage and sewage and garbage disposal.

(b) Sanitary surveys required in the investigation of epidemics.

Office Work—

(a) Examination and approval of plans and specifications for water works, sewers and sewage treatment plants.

(b) Consultation service by correspondence relative to water works, sewerage, sewage and garbage disposal, and so forth.

(c) Advice and consultation relative to installation of water works, sewers, sewage treatment and garbage disposal, to engineers, municipal officials and other parties, visiting the office of the State Board of Health for the purpose of receiving such service.

(a)

FIELD INVESTIGATIONS MADE BY THE CIVIL AND SANITARY ENGINEER—FOR THE YEAR ENDING JUNE 30, 1914.

The fiscal year ending June 30, 1914, represents the first year of service of the engineer under the reorganized state board of health. Prior to the reorganization of the state board of health, the services of the engineering member of the state board of health were not compensated by the state. This plan did not give to the citizens of the state the field services of the engineer of the state board of health, unless the localities requiring the services of the engineer paid the entire expenses for such service. Such service as the engineer was able to render through correspondence during the years prior to the reorganization of the state board of health, was rendered free of expense to the parties asking for, and entitled to, such service. This service became very laborious during the last years under the old board of health. The necessity for field investigation became so urgent, during the last few years, that the thirty-fifth general assembly in reorganizing the state board of health provided for the services of the civil and sanitary engineer, which services, together with the necessary incidental and traveling expenses, were to be paid for by the state. It was the intention that any municipality or locality needing the services of the engineer of the state board of health in matters pertaining to the health and life of their citizens, should have the services of the engineer free of expense.

The following are the field investigations made by the engineer from July 4, 1913, to June 30, 1914:

JULY, 1913.

Ogden, Iowa. Population about 1,500.

Investigation made on petition of the town council of Ogden.

PURPOSE—To advise regarding installation of sewer system.

A preliminary sanitary survey of Ogden was made by the engineer to enable him to make a preliminary estimate of the probable cost of a sewer system with sewage disposal plant. This estimate enabled the town council and citizens to direct their plans for the future in the proper manner to accomplish the installation of the proposed sewer system. At the present time, plans are being considered for the installation of the sewer system with the intention of installing the work without further delay.

Maple, Iowa. (Mining town.)

Investigation made on petition of citizens.

PURPOSE—To determine means of furnishing a water supply for the residents of Maple.

A visit was made to the town of Maple by the engineer. This new mining town having a population of about 230 people, of which 111 were children, was practically without water. A number of shallow wells had been dug, but were yielding little or no water. A conference with the coal company owning this town, after a report was made to the secretary-executive officer of the Board of Health, resulted in making satisfactory provisions for supplying these people with water.

AUGUST, 1913.

Macksburg, Iowa. Present population about 300.

Investigation made on petition of town council and health officer.

PURPOSE—To advise about the installation of residential septic tanks for the disposal of sewage.

Mount Ayr, Iowa. Present population about 1700.

Investigation made on petition of town council and health officer.

PURPOSE—Location of public water supply at Mt. Ayr.

SEPTEMBER, 1913.

Lenox, Iowa. Population 1,300.

Investigation made on petition of town council.

PURPOSE—To determine location of catchment area and impounding reservoir for the public water supply at Lenox.

An extensive investigation of territory adjacent to Lenox was made and a complete report of this investigation was made to the town council

of Lenox. The care necessary in the selection of a suitable catchment area was taken in this survey.

Farmington, Iowa. Population 1,200.

Investigation made on petition of town council.

PURPOSE—To advise concerning the use of an old, open sewer.

An old, storm water, stone walled, open sewer, a few blocks long, had been made use of as a sanitary sewer. This open, storm sewer has been covered by street crossings, but is not safe or sanitary. Its further use as a sanitary sewer is forbidden and the officials of Farmington are advised that a sanitary sewer system must be installed in the near future.

Keokuk, Iowa. Population 14,000.

Investigation made on petition of citizens of Keokuk.

PURPOSE—To investigate conditions resulting in a residence district in the south part of Keokuk from a failure to properly extend a main sewer.

Conditions were found as represented by the petitioners. The health and welfare of several hundred people were menaced by the discharge of sewage from a portion of Keokuk, this discharge being an open sewage stream running for a distance of nearly one thousand feet through a resident portion of Keokuk. Following a report to the secretary-executive officer of the board of health, an agreement was reached with the city council of Keokuk on a method of procedure to correct the conditions found. The necessary legal steps were taken to provide the necessary funds for this improvement.

OCTOBER, 1913.

Rockwell City, Iowa. Present population about 1,700.

Addressed a public meeting of Rockwell City citizens.

PURPOSE—To advise concerning sanitary improvements necessary to abate typhoid fever epidemic.

This public meeting was held at the close of a complete sanitary and epidemiological survey of Rockwell City occasioned by a typhoid epidemic.

Durfee (Rex), Iowa. (Mining town.)

Investigation made on petition of residents of Durfee.

PURPOSE—To investigate condition of water supply and unsanitary conditions existing in the town.

After a report of these conditions was made to the secretary-executive officer of the board of health, the necessary orders were issued to the local board of health for the correction of the unsanitary conditions found existing. The local board of health transmitted these orders to the officials of the coal company that owned the town and the necessary corrections were made.

Clinton, Iowa.

Investigation made on petition of city council and health officer.

PURPOSE—To decide on location of detention hospital.

It was proposed to locate a city detention hospital on the grounds of Agatha Hospital, located within the city limits of Clinton. The residents of the vicinity adjacent to Agatha Hospital objected to the location of the detention hospital on the grounds of Agatha Hospital. The feeling was aggravated and intense. Following the investigation of the engineer, and the report based thereon, the detention hospital, with the approval of the secretary-executive officer of the state board of health, was located on the grounds of Agatha Hospital. The hospital is now constructed and in operation:

Storm Lake, Iowa. Population 2,500.

PURPOSE—Supervision of water purification plant of Storm Lake public water supply.

The filtration plant at Storm Lake, Iowa, had been installed the year previously under the advice and supervision of the engineer of the state board of health. The present supervision is simply a part of our duties under the reorganized state board of health. However, a constant supervision of this purification plant is necessary until all of the difficultes are removed.

Mitchellville, Iowa. Population 900.

Investigation made on petition of city council.

PURPOSE—Location of public water supply for Mitchellville.

Davenport, Iowa.

Investigation made on petition of city council and hospital association.

PURPOSE—To investigate location of tuberculosis hospital.

Decided local opposition to the proposed location of the tuberculosis hospital developed before the construction of the hospital building was started. After starting the construction of the hospital building the offended residents living in the vicinity of the hospital grounds prepared to take the matter into court. The state board of health was appealed to, and this investigation having been made by the engineer of the board of health who met with the board of supervisors of Scott county, and the officers of the hospital association, and who then reported back to the secretary-executive officer of the state board of health, the secretary-executive officer approved the location of the tuberculosis hospital and the work of construction of said hospital proceeded without further interruption by the citizens of Davenport.

NOVEMBER, 1913.

Fort Dodge, Iowa. Population 16,000.

Investigation on petition of city council and health officer.

PURPOSE—To decide on sufficiency of garbage disposal.

The problem of garbage disposal is unsolved in Iowa. Considerable dissatisfaction and objection existed in the matter of garbage disposal as provided by the municipal authorities of Fort Dodge. The counsel given to these authorities was partly for the purpose of alleviating complaints and partly to assist them in the installation of a proper garbage disposal system, involving the probable construction of a garbage disposal plant.

Storm Lake, Iowa.

Continuation of work with water filtration plant.

Albert City, Iowa. Population about 300.

Investigation made by order of Dr. Sumner, secretary-executive officer.

PURPOSE—Investigation of supposed typhoid epidemic.

An investigation of the conditions at Albert City revealed the ravages of an unknown endemic disease, quite fatal in results. The sanitary survey of Albert City revealed the necessity of active measures on the part of the town authorities to properly dispose of the sewage which at present constitutes a menace to the health of the citizens of the town. The proper advice was given to the town officials by the sanitary engineer of the state board of health.

Sioux City, Iowa.

Investigation made by order of Dr. Sumner, secretary-executive officer.

PURPOSE—To investigate the provisions made by the board of supervisors of Woodbury county, for the care of incurable tuberculosis patients.

The provisions made for such patients consisted of a four room cottage located upon the grounds of the Sioux City detention hospital. A report of this investigation was filed with the secretary-executive officer of the state board of health.

Industrial School, Mitchellville, Iowa.

PURPOSE—Construction of new filter beds for disposal plant at the Industrial School.

This service was rendered to the state board of control on their request. It involved several trips to Mitchellville during the progress of the work.

Andersonville, Iowa. (Mining town.) About 200 population.

Investigation made on petition of residents of Andersonville.

PURPOSE—To investigate sufficiency and character of water supply. Also to investigate sanitary conditions. This being a new mining town, the investigation will continue until final recommendations for sanitary requirements are made.

DECEMBER, 1913.

Industrial School, Mitchellville, Iowa.

PURPOSE—Completion of work of supervision on new filter beds for sewage disposal plant at Industrial School.

Stratford, Iowa. Population about 600.

Investigation made on petition of town council.

PURPOSE—To assist town council in their efforts to install a sanitary sewer system with sewage disposal plant.

This service involved an investigation of what appeared to be the beginning of a typhoid epidemic, caused by the use of polluted well water. A complete sanitary survey of the town of Stratford was made involving chemical analyses of the water from fifty-three of the wells used by the residents as a source of water supply. A public meeting was held which was attended by about all of the property owners in Stratford. The proposition of sewer installation was fully discussed at this meeting, both from an economical and sanitary standpoint. The efforts have met temporary failure but the people are still at work endeavoring to install the sewer system. The need for assistance was very great. The attempt to install

a sewer system in Stratford was made by those citizens who recognized the necessity of such municipal improvements.

Cherokee, Iowa. Population about 5,000.

Investigation made by order of Dr. Sumner, secretary-executive officer.

PURPOSE—Investigation of typhoid epidemic.

At this time epidemiological data were taken, and the investigation continued at a later date.

JANUARY, 1914.

Fontanelle, Iowa. Population 800.

Investigation made on petition of Fontanelle citizens.

PURPOSE—To investigate public water supply.

In this instance the town council had installed a system of water works, and proposed to take the water supply from shallow wells located in the heart of the town, where such supply would have been seriously contaminated. The use of these wells was forbidden by the state board of health. The investigation of the sanitary engineer consisted of a sanitary survey of the town of Fontanelle, a conference with the members of the town council, the collection of numerous water samples for analysis, and the completion of an exhaustive report of the findings, together with recommendations for the direction of the town council. The situation is well in hand, and the officials of Fontanelle are endeavoring to locate a satisfactory source of water supply. In the meantime the order of the state board of health prohibiting the use of the polluted wells was adopted by the town council and remains in force.

Cherokee, Iowa.

PURPOSE—Continuation of investigation of epidemic of typhoid fever. At this time a complete sanitary survey of Cherokee was made. This survey included the analyses of a large number of water samples from private wells. It also included an investigation of the existing sewer system, revealing defects of construction of the sewer that were in part responsible for the contamination of wells, from which the typhoid fever was transmitted.

FEBRUARY, 1914.

Chelsea, Iowa. Population about 600.

Investigation made on petition of mayor and town council.

PURPOSE—To locate wells for public water supply for Chelsea.

Grinnell, Iowa. Population about 6,000.

PURPOSE—To investigate a location of proposed sewage disposal plant for new sewer system.

On account of past difficulties of sewage disposal at Grinnell, and the litigation connected therewith, it was necessary to exercise more than ordinary care in the present emergency.

Oakland, Iowa. Population 1,100.

Investigation made on petition of mayor and town council.

PURPOSE—Investigation of public water supply.

Investigations show that present wells must be abandoned and a new source of supply located.

Mason City, Iowa. Population 16,000.

Investigation made on request of mayor.

PURPOSE—To consider method of sewage disposal for Mason City.

This is a matter of several years' standing. Several city sewers empty into a small stream running through the city. The city recognizes the necessity of sewage disposal, but desired a conference as to proper methods.

Charles City, Iowa. Population about 8,000.

Investigation made on request of mayor.

PURPOSE—To consider methods for sewage disposal.

Charles City has several sewers emptying into the Cedar river. The condition is very bad at low stage of water. The city must install a sewage disposal plant. The engineer investigated the entire situation, and made the proper recommendations to the city council. So far the city council has not taken the necessary steps to install sewage disposal.

Ankeny, Iowa. Population about 500.

PURPOSE—To address public meeting after making sanitary survey of Ankeny requested by the health officer. Recommended that the town of Ankeny take up the question of installing a public water supply and sewer system with sewage disposal plant.

MARCH, 1914.

Guthrie Center, Iowa. Population 1,600.

Investigation made on petition of citizens of Guthrie Center.

PURPOSE—To make a complete sanitary survey of Guthrie Center.

The engineer made a complete sanitary survey of Guthrie Center, which revealed startling conditions. The installation of toilets and other modern conveniences in the homes had reached the number of nearly 200. The cess pools used by these people for the disposal of sewage had so contaminated the soil that the water supply of the town was being seriously contaminated, making the danger of epidemics very great. The engineer made a complete report of his findings to the secretary-executive officer of the state board of health, recommending that the town of Guthrie Center install a sewer system at the earliest possible moment. The secretary-executive officer summoned the town council of Guthrie Center to meet with the state board of health, to consider the situation. This meeting was held and the town council of Guthrie Center agreed to take the necessary steps looking toward the installation of the sewer system. The town of Guthrie Center has proceeded along these lines and the sewer system will be completed during the year 1914.

Carson, Iowa. Population about 700.

Investigation made on petition of mayor and town council.

PURPOSE—To locate the source of public water supply for Carson.

The town of Carson had let a contract for the construction of a water works system, and had dug some shallow wells in the heart of the town, from which to obtain their water supply. These wells were found by analysis to be highly polluted. The engineer of the state board of health investigated the several opportunities, or possible locations, for the necessary wells. A satisfactory location was found.

Oakland, Iowa.

PURPOSE—Location of new source of supply for public water supply.

Second trip to Oakland made necessary by difficulty in obtaining privilege to locate wells on private farm land. New location selected. Third trip was made to give further assistance in location of water supply.

Leon, Iowa. Population 2,000.

Investigation made on request of mayor and town council.

PURPOSE—To investigate sewage disposal plant.

This disposal plant is not complete and in its present location is objected to by the residents. The engineer of the state board of health recommended a new location where a sewage disposal plant could be installed. The recommendation was followed, but the work is not completed.

Dedham, Iowa. Population about 400.

PURPOSE—Investigation of typhoid epidemic.

Investigation ordered by Dr. Sumner, secretary-executive officer.

Sheffield, Iowa. Population about 850.

Investigation made on petition of mayor and town council.

PURPOSE—To locate wells for public water supply for Sheffield. Also to locate sewage disposal plant.

The town of Sheffield is installing a public water supply system and the sewer system with sewage disposal plant.

Audubon, Iowa. Population 2,000.

Investigation made on petition of mayor and town council.

PURPOSE—To make a preliminary sanitary survey of the town of Audubon, and to address a public meeting of the citizens on the question of sewers.

Considerable correspondence passed between the officials of Audubon and the engineer of the state board of health before this public meeting was held. A considerable amount of correspondence has occurred since the public meeting was held. The officials of Audubon have taken the necessary steps to install a sewer system.

Holstein, Iowa. Population about 1.000.

Investigation made on petition of town council.

PURPOSE—To investigate the sewage disposal plant at Holstein.

This sewage disposal plant is one of the complete failures that may be occasionally found. The condition and operation of this disposal plant were completely investigated by the engineer of the state board of health. A full report of his findings recommending a rebuilding of the filters was filed with the secretary-executive officer of the state board of health, and a copy of this report was sent to the town council of Holstein. The findings were accepted by the town council, and an engineer was employed to prepare new plans and specifications for the filter beds. These plans have been prepared and approved by the Iowa state board of health, and the town council of Holstein expects to proceed without delay to install the new filter beds and make some necessary changes in the existing septic tank.

Carroll, Iowa. Population about 5,000.

Investigation made at the request of the county attorney.

PURPOSE—To investigate the reported failure of the sewage disposal plant, at Carroll.

The filters were found to be clogged. A conference was held with the city engineer, and a procedure agreed upon for the correction of the filter beds.

APRIL, 1914.

Davis City, Iowa. Population about 600.

Investigation made on petition of mayor and town council.

PURPOSE—To locate wells for public water supply.

The authorities of Davis City had to let a contract for a public water supply system which contemplated using the water from shallow wells located within the town at a point where it was impossible to obtain anything but seriously polluted water. The mayor and town council accepted the decision of the engineer of the state board of health as final, and began the consideration of a new source of water supply. The distribution system is about completed, but the supply has not yet been located.

Humeston, Iowa. Population about 1,100.

PURPOSE—To investigate sewage disposal at the high school building in Humeston.

The school authorities installed a private sewage disposal plant some years ago, when the high school was built. The town of Humeston does not have a regular sewage system. This small disposal plant failed to do its duty during last winter. The school authorities did the best they could to take care of the sewage from the high school, and the engineer of the state board of health agreed to advise the school board as to the proper remedy at the close of the school year. This advice has been given, and the school board is making the necessary improvements during the summer of 1914. The provisions made are supposed to be sufficient until the town of Humeston installs its sewer system, at whcih time the high school building will be connected with the sewer system.

Bedford, Iowa. Population about 2,000.

Investigation made on petition of mayor and city council.

PURPOSE—To consider the installation of a sewage disposal plant.

Bedford has a sewer system which empties into a small stream running through adjoining farms. The town is defendant in an action in court brought by a farmer who objects to the pollution of the water of the small stream which runs through his farm. Bedford will be compelled to build a proper disposal plant. They have received such advice, and are taking the necessary steps to comply. The water supply of Bedford was also considered during this visit.

Bear Creek, Iowa. (Mining town.) Population about 150.

Investigation made on petition of Bear Creek residents.

PURPOSE—To investigate scarcity and unsanitary conditions of water supply of Bear Creek, also to investigate other unsanitary conditions existing in the town. Recommendations for the improvement of the conditions are on file, and the coal company responsible was directed to carry out the recommendations.

Denison, Iowa. Population about 3,500.

Investigation made on request of the mayor and town council.

PURPOSE—To consider methods for completing the sewerage of Denison and to consider the proposed sewage disposal plant, and the location of the same. Also to consider the protection of the public water supply. The recommendation was made to the town council, after going over the entire situation, that they proceed to employ an engineer to completely design the sewer systems for Denison. The town is so situated that several sewer districts will be necessary. The town council accepted this recommendation and has employed an engineer to prepare the plans and specifications for the sewer systems and sewage disposal plants. This engineer has held one conference with the engineer of the state board of health, and other conferences are expected to follow.

Templeton, Iowa. Population about 300.

Investigation made on request of board of supervisors of Carroll county.

PURPOSE—To consider discharge of sewage into county drain at Templeton.

This situation was fully investigated, and a report embodying recommendations made to the secretary-executive officer of the state board of health, and also to the board of supervisors and county attorney of Carroll county.

MAY, 1914.

Oelwein, Iowa. Population about 6,000.

Investigation made on request of mayor and city council.

PURPOSE—To investigate possible location for new public water supply, and to pass upon the recommendation made by A. T. Maltby, consulting engineer, Chicago, Ill. Also to investigate the sewage disposal plant at Oelwein and make recommendations for the improvement of the same.

The city of Oelwein must locate and install a new public water supply, from deep well sources. The situation has been studied by Mr. Maltby, consulting engineer, and a report made to the city council at Oelwein.

Ankeney, Iowa.

PURPOSE—To continue efforts looking toward installation of public water supply and sewer system. Discussed the matter with the town council and citizens.

State Hospital, Mt. Pleasant, Iowa.

PURPOSE—To investigate sewage disposal plant at state hospital.

This investigation was made at the request of the state board of control. The disposal plant requires filter beds far in excess of present provision. The engineer of the state board of health made the necessary surveys to obtain data for the preparation of plans and specifications for new filter beds.

Eldon, Iowa. Population about 2,000.

Investigation made on petition of mayor and town council.

PURPOSE—To investigate unsanitary conditions resulting from imperfect sewer facilities and lack of sewage disposal. The problem of a new water supply for Eldon was also considered. A complete sanitary survey of Eldon has been made, including the testing of all of the private wells used as a source of water supply. Recommendations were made to the town council advising them to take the necessary steps to locate a new public water supply and to install a complete sewer system with sewage disposal plant.

It is understood that the advice of the engineer of the board of health will be followed.

Postville, Iowa. Population about 1,000.

Investigation made upon petition of citizens of Postville, Iowa.

PURPOSE—To make a complete sanitary survey of Postville to determine the extent of unsanitary conditions caused by the cess pool method of sewage disposal.

Postville has a satisfactory public water supply. The desire of the residents of Postville to install modern conveniences in their homes has led to the installation of about eighty-five toilets, a corresponding number of bath-tubs and sinks. The out-flow from these installations goes into cess pools principally, which sometimes overflow into tile drains, sometimes into the alley, and sometimes, by seepage, into adjacent soil. The result is that considerable amounts of unpurified sewage are finding their way to the surface of the soil and constitute a menace to health. The analysis of the water of the private wells shows that the well water is being continually contaminated from the seepage of these cess pools finding its way into the common water-bearing strata which furnish the water to the wells. A complete report of the findings of the engineer of the state board of health, in which it is recommended that the town of Postville proceed without delay to install a sewer system with sewage disposal plant, was made to the secretary-executive officer of the board of health and a copy of the same, to which was attached the order of the secretary-executive officer of the board of health, has been sent to the mayor of Postville, Iowa. Steps have been taken to install a sewer system, which will be installed in 1915.

Barnes City, Iowa. Population about 500.

Investigation ordered by Dr. G. H. Sumner, secretary-executive officer.

PURPOSE—To investigate epidemic of typhoid fever.

The epidemiological investigation of this epidemic was made by Mr. A. M. Alden, assistant bacteriologist of the state board. The sanitary survey of the town of Barnes City was made by the engineer of the state board of health, assisted by Mr. Jordan, assistant chemist for the board of health. The complete report of these investigations made to the secretary-executive officer of the state board of health was made jointly by the parties engaged in making the investigation. A copy of this report was sent to the mayor of the town, and it is expected that the recommendations for the correction of the wells will be followed out at once and that the recommendations for the municipal improvements mentioned will be followed out as soon as the same can be legally provided for. The full report is included in this biennial report.

McGregor, Iowa. Population about 1,300.

Investigation made on petition of mayor and town council.

PURPOSE—To advise concerning installation of sewer system and sewage disposal plant.

The town of McGregor is peculiarly situated. It occupies a small valley snugly bounded by hills 300 feet high. The disposal of storm water has been difficult, for the reason that a heavy downpour of rain on the drainage area which outlets through this small valley or defile floods the

streets to great depths at times. A peculiar system of stone walled storm drains, or sewers, has been constructed during past years. The construction of these out-dates the time of the average resident now living in McGregor. In the absence of a sanitary sewer system, these storm water drains have been used to a considerable extent as open sewers. It is now the desire of the authorities of McGregor to correct the unsanitary conditions by installing a sanitary sewer system. This will be attended with great difficulty, owing to the necessity of laying the greater part of this sewer system in loose rock, or solid rock sub-strata. The engineer of the state board made a careful examination of surface conditions and has rendered a report to the mayor and town council of McGregor advising as to the character of the sewer to be constructed, and the probable cost of the same. It is expected that complete plans and specifications for the sewerage of McGregor will be prepared and a part of the work of installation completed during the year of 1914.

JUNE, 1914.

Newton, Iowa. Population about 5,000.

Investigation ordered by Dr. G. H. Sumner, secretary-executive officer.

PURPOSE—To make sanitary investigation of epidemic of diphtheria.

This epidemic was one of the worst of its kind in recent years. The epidemiological investigation was made by Mr. A. M. Alden, assistant bacteriologist of the state board of health, who has reported his findings to the secretary-executive officer. The sanitary survey made by the engineer of the state board of health has included, to date, an examination of sewer outlets, which outlets are all located on pasture lands belonging to farmers, or other parties pasturing live stock. The mayor and town council have petitioned for the services of the engineer of the board of health in determining methods of installing adequate sewage disposal plants. This matter will be taken up in the near future.

Tripoli, Iowa. Population about 800.

Investigation made on request of mayor and town council.

PURPOSE—To make sanitary survey of Tripoli, with a view to the installation of a sewer system and sewage disposal plant.

Tripoli has a public water supply. The installation of a sewer system is a public necessity. The engineer of the state board of health investigated the conditions, and recommended to the town council that they proceed to have complete plans and specifications prepared for a sewer system with sewage disposal plant. These recommendations are now being carried out.

Nora Springs, Iowa. Population about 1,000.

Investigation made on petition of mayor and town council, and also upon a separate petition of citizens of Nora Springs.

PURPOSE—To investigate pollution of the Shell Rock river by the discharge of sewage from the town of Nora Springs.

The investigation showed that a small sewer carrying a small amount of sewage from the business portion of Nora Springs was emptying such sewage unpurified into the Shell Rock river. It also appeared that extensions of considerable length to the present sewer were to be con-

structed during the present season. The engineer of the state board advised the town council of Nora Springs to employ an engineer to make a complete survey of the town for the purpose of making complete plans and specifications for the sewer system with sewage disposal plant. This recommendation was agreed to by the town council. It was considered necessary to test the water of all the private wells used as a means of water supply. This has been done, and a sanitary survey completed.

Mount Ayr, Iowa. Population about 1,700.

Investigation made on request of town council and health officer.

PURPOSE—To advise concerning the installation of a sewer system, with sewage disposal plant.

The installation of a sewer system at Mt. Ayr is directly following the installation of their public water supply system. The usual sanitary survey was made by the engineer of the state board. A public meeting of the citizens of Mt. Ayr was held for the discussion of the sewer problem. Following this meeting, on the recommendation of the engineer of the state board, the engineer employed by the town council of Mt. Ayr was instructed to make the necessary surveys to obtain the data for preparing complete plans and specifications for the sewer system and sewage disposal plant.

Humeston, Iowa. Population about 1,100.

Investigation made at request of town council.

PURPOSE—To investigate proposed sources of public water supply and recommend a satisfactory source of supply.

The town of Humeston has had no public water supply. The different sources of supply, shallow wells, deep wells, and impounding reservoir, had all been considered by the town council and their local engineers. Investigation of the engineer of the state board of health resulted in his approval of the catchment area and impounding reservoir as located by the engineer employed by the town council. Plans and specifications for the impounding reservoir have been prepared and have been approved by the Iowa state board of health. The work will be carried forward without delay.

Winfield, Iowa. Population about 950.

Investigation made at request of mayor and town council.

PURPOSE—To locate source of public water supply.

The investigation of the engineer of the state board of health resulted in the recommendation that a deep well supply be attempted. This investigation is still in progress. The necessary analyses of water are being made.

Yoder, Iowa. Population about 90. (Mining town.)

Investigation made on petition of citizens of Yoder.

PURPOSE—To investigate conditions of water supply and other unsanitary conditions.

Water of all the wells in Yoder was tested by the chemist. Report of conditions made to the secretary-executive officer of the state board of health, and the order of the secretary-executive officer will follow. The company owning the town is ready to comply with the orders of the state board.

SUMMARY OF FIELD INVESTIGATION OF ENGINEER OF IOWA STATE BOARD OF HEALTH.

Name of Town.	Population	Purpose of Investigation.
Albert City	200	Investigation of epidemic.
Andersonville	200	Water supply.
Ankeny	500	Water supply and sewage disposal.
Audubon	2,000	Sewer system.
Barnes City	500	Typhoid epidemic investigation.
Bear Creek	150	Water supply.
Bedford	2,000	Sewage disposal.
Carroll	5,000	Sewage disposal.
Carson	700	Water supply.
Charles City	8,000	Sewage disposal.
Chelsea	600	Water supply.
Cherokee	500	Typhoid epidemic investigation.
Clinton	26,000	Location of hospital.
Davenport	43,000	Location of hospital.
Davis City	600	Water supply.
Dedham	400	Typhoid epidemic investigation.
Denison	3,500	Sewer system.
Durfee (Rex)	200	Sanitary investigation.
Eldon	2,000	Water supply and sewage disposal.
Farmington	1,200	Sewage disposal.
Fontanelle	800	Water supply.
Fort Dodge	16,000	Garbage disposal.
Grinnell	6,000	Sewage disposal.
Guthrie Center	1,600	Sewer system, sanitary survey.
Humeston (school board)	1,100	Sewage disposal.
Humeston	1,100	Water supply.
Holstein	1,000	Sewage disposal.
Keokuk	14,000	Sewage disposal.
Lenox	1,300	Water supply.
Leon	2,000	Sewage disposal.
Mount Ayr	1,700	Water supply and sewage disposal.
McGregor	1,300	Sewer system.
Mt. Pleasant State Hospital		Sewage disposal.
Macksburg	300	Sewage disposal.
Maple	230	Water supply.
Mason City	16,000	Sewage disposal.
Mitchellville	900	Water supply.
Mitchellville Ind. School		Sewage disposal.
Newton	5,000	Sewage disposal.
Nora Springs	1,000	Sewer system, sanitary survey.
Oakland	1,100	Water supply.
Oelwein	6,000	Water supply and sewage disposal.
Ogden	1,500	Sewer system.
Postville	1,000	Sewer system and sanitary survey.
Rockwell City	1,700	Sanitary investigation.
Sheffield	850	Water supply and sewer system.
Sioux City	48,000	Inspecting hospital.
Storm Lake	2,500	Water supply, supv. filter plant.
Stratford	600	Sewer system and sanitary survey.
Templeton	300	Sewage disposal.
Tripoli	800	Sewer system.
Winfield	950	Water supply.
Yoder	90	Water supply.

(b)

SANITARY SURVEY OF ROCKWELL CITY, IOWA, SEPTEMBER, 1913.

This investigation was made in response to a petition and at the request of the local board of health of Rockwell City, Iowa. Rockwell City has a population of about 1,700.

Each year for several years prior to the time of this investigation there have occurred a number of cases of typhoid fever.

In the year 1911 there occurred twelve cases and one death. Six of these cases were adults and six were children. Six of the cases were males and six were females. Five of the children developed typhoid fever after attending a *child's party* at one of the homes. One of the adult cases, female, developed in a residence where the sewage of the premises was running into an abandoned well under the house. Three of these cases used city water. The remaining cases used well water from shallow wells situated on the premises.

In 1912 there were twenty-three cases of typhoid fever. A complete record of these cases could not be obtained, but the facts collected indicate that nine of the cases were adult cases, and the remaining fourteen were children. Three deaths are reported. Three of these cases used city water and the remaining twenty used well water from shallow wells situated on the premises. The histories of these cases did not indicate an epidemic, but rather, an endemic perpetuation of the disease.

In the year 1913, up to October 1, 1913, there occurred fifteen cases of typhoid fever. Of these fifteen cases, eight were adult cases, two were children grown, and the remaining five were children fourteen years of age and under. Of the adult cases, seven were females. One of the adult cases was seventy years of age. So far as determined, only one of these cases used city water, the remaining cases using the water from shallow wells. The histories of these cases indicate endemic origin, rather than the existence of an epidemic, the outbreak continuing over a period from September 10, 1913, to October 10, 1913.

The greater part of this investigation was made by the chemist, Prof. Charles N. Kinney, and his assistant. The engineer of the board of health visited Rockwell City at the close of this investigation, and his survey corroborates the findings of the chemist.

(Lafayette Higgins.)

The following is a briefed copy of the report made to the mayor and council at Rockwell City:

REPORT ON THE INVESTIGATION OF TYPHOID AND GENERAL SANITARY CONDITIONS OF THE TOWN OF ROCKWELL CITY, IOWA. CONTINUING OVER THE PERIOD FROM SEPTEMBER 10, 1913-OCTOBER 10, 1913.

(Report made October 17, 1913.)

To the Mayor and Council:

Gentlemen:

We have the following report to make on the investigation of the typhoid conditions and general sanitary status of the town of Rockwell City, extending over a period of three or four weeks.

During the early part of September a petition was filed with the secretary of the state board of health, asking for an investigation of the typhoid conditions existing in your town, and after some correspondence between the mayor and the secretary of the state board of health, the state board of health and health commissioner ordered the chemist and his assistant to report to you at once to take charge of the situation, in case it was deemed advisable, to make a thorough investigation. We reported to the mayor and health officer on September 10th.

We found the people quite generally considerably wrought up over the general health conditions of the town and especially the continued and large amount of typhoid, which had been prevalent there for a number of years. We found that there had been from forty to fifty cases of typhoid fever in the town during the past three years and that there had been, in addition, a number of cases of malaria or some type of fever, which may or may not have been mild cases of typhoid. We found that there had been a number of deaths from typhoid and a number of cases had been of great severity.

We found that about five years previous, at a men's banquet given in one of the churches, there had developed therefrom some thirty or forty cases of typhoid, with seven or eight deaths resulting, and that there had been considerable typhoid in the community steadily for a good many years previous.

The town is located in a flat or level portion of the country, where we have gravelly knolls, interspersed with ponds and flat or swampy ground. The center of the town occupies a small knoll, much of which is gravelly or pockety in nature; and completely surrounding the town, originally, was pondy, flat, swampy land, which has in recent years been drained of surface water.

It is apparent that the town has been experiencing, outside of the epidemic resulting from the banquet before mentioned, something like fifteen or eighteen cases per year, which would be probably five or six times as much typhoid as would be considered normal. Little attempt has ever been made to clean the privy vaults or to remove filth or slops from the dwellings and yards. Therefore, it is evident that the water supply would be badly contaminated, as practically all the water being used for drinking purposes was supplied by shallow wells situated in the middle of the lots and varying from twenty to sixty feet from the outbuildings. Under these conditions, it was our opinion that the cause of the trouble was the water supply of the town.

We provided chemical and bacteriological equipment and examined from ninety to one hundred samples of water to determine the presence or absence of sewage contamination. A number of complete sanitary and bacteriological examinations were made in the laboratory at Des Moines. In all cases we found that practically all of the water used was receiving sewage in greater or less amounts. Sufficient information was gained by this examination to show without doubt that the water supply of the town was in very bad condition and the likely cause of the trouble which had been experienced.

A systematic examination of the various industries furnishing ice cream, butter, milk, restaurants, hotels and markets, etc., has been made and we find as follows in each respective case:

ICE CREAM FACTORY.

The ice cream factory, which furnishes practically all of the ice cream used in the town, is a large establishment, manufacturing a large amount of ice cream, most of which is shipped to the surrounding towns, but is used also largely by local people. We find that this factory seems to be kept up in fairly good general sanitary conditions, probably as good as would be the general run of ice cream factories over the state. We found the employees to be handling articles used for containing the ice cream with their naked hands and consequently, an opportunity for the infection of the food product. This is a condition which should not exist, as it is easily remedied by the use of gloves during the handling of such containers. The gloves can be kept clean and only used at times when the containers are to be handled. Flies were abundant in the factory, and had opportunity to come in contact with the ice cream at different stages of the manufacture. Screens were on the building, but seemed to be not very effective as operated. The men employees of the building were using an outside toilet in poor sanitary condition.

BUTTER FACTORY.

The butter factory we found to be operated by the owner of the ice cream factory and in an adjoining portion of the same building. The two are practically operated together, and the same criticisms which have been made for the ice cream plant would apply to the manufacture of the butter.

CANNING FACTORY.

The canning factory, used for canning corn, tomatoes and other vegetables and fruits, at the time of this investigation was not running. An examination of the conditions and surroundings, and a consultation with the manager of the plant, lead to the opinion that satisfactory precautions are taken in the handling of the food and the manner in which it is sterilized.

POULTRY HOUSE.

The poultry house, situated in the southeast portion of the town, on flat ground, not packing or dressing at the time of this investigation, contained a few men at work preparing crates, etc. In this place we found the general sanitary conditions to be very poor. The outbuildings used were bad. Water, during wet times, would stand around the building and in the basement.

ICE SUPPLY.

The ice supply of the town is furnished largely from ice obtained from East Okoboji Lake, with a small amount from the lakes north of town. We obtained a sample of the last of the Okoboji ice, a little of which was still remaining in the ice house, and a careful examination of this ice, both by sanitary analysis and a bacteriological examination, revealed a poor condition of the ice, showing sewage effluent present in the water at the time of freezing, and that the ice still contained sewage forms. It would evidently be true that this ice must have been in much worse condition during the early or middle portion of the summer than at the time of this investigation, as storage of ice improves its sanitary condition very much, by the dying out of the disease germs, bacteria and micro-organisms of all forms.

HOTELS AND RESTAURANTS.

We found on examining the hotels and restaurants of the town, of which there are some half dozen or more, that the water used at all of these locations is water from wells located immediately back of the respective establishments, and wells in which we have found the water to be in very bad condition. The owners seemed to be willing to use any supply that would be free from objection, but had themselves made no effort to determine whether the water was good or not, but simply used the water nearest at hand. We found in most all cases that flies were abundant in the kitchens and dining rooms.

MEAT MARKET.

The meat market in the town seems to be generally in good sanitary condition, except the well which is used by the market. This well, situated back of the market, now stands underneath some one of the rear buildings, and in close proximity to outbuildings, and is in exceedingly bad sanitary situation. Water from this well is used for general washing and cleaning purposes in the meat market, and undoubtedly there is some chance for contamination from the use of this water.

MILK SUPPLY.

We find that the milk supply of the people of the town is provided mainly by private individuals owning their own cows, but there are a few persons distributing milk around town to various people. We find that these distributors are operating their milk supplies in reasonably good sanitary manner, and the only criticism is the use of water, for cleaning and washing the containers, from wells which are not in good sanitary condition. This would leave the matter open to serious criticism. Wherever milk is to be distributed, no water that is polluted should be used for washing and cleaning the containers, or which comes in contact with the milk in any way, unless the water is boiled thoroughly before it is used.

PUBLIC SCHOOLS.

The public schools of the town are operating in a clean, sanitary manner; toilets, etc., seem to be in good condition, and the water used is from the public supply.

SEWER SYSTEM.

The sewer system of the town, from information that has been furnished me, seems to be in very poor condition. At times of heavy downpour, the sewers become choked and the sewage backs up into the base-

ments of some of the residences, and on receding, leaves a dirty, befouled condition in these places. The system, as laid, evidently is leaky and is quite limited in extent, so that the people of the town are not furnished adequate means for disposal of sewage.

CITY WATER.

The city water is obtained from two deep wells located close to the center of town and in a location which is open to some objection on account of the unsanitary surroundings. We find the water to contain considerable iron and to be quite hard, and on this account the people of the town have objected to its use, and it has been little used for drinking and culinary purposes. In addition to this defect, there has been some seepage of oil into the water from old oil tanks, which, especially at certain times, has been very objectionable in the water. We find that the old tanks, situated at the rear of the electric light plant, which are standing perhaps two-thirds full of oil, used formerly for fuel purposes, but now not used at all, probably have sprung some leak through pitting of pipes and undoubtedly oil is oozing out into the ground around the wells. We found that the first well dug for city purposes located close to the deep wells and about forty-five feet deep had several feet of oil standing on top of the water, and doubtless this is a condition that should not exist, and the oil should be drawn off and disposed of and the place cleaned up generally. Within distances of two hundred to three hundred feet of the wells there are quite a number of open privy vaults, which should not be allowed to exist. There is, undoubtedly, some seepage of surface water reaching the wells, probably because the casings are not tight. At least, there is the admission of surface water gaining access to the wells from some source. This being true, all care should be taken that the surface water that does get in is free from any objectionable contamination.

A water treatment plant should be installed which will treat the water to remove the iron and hardness, and thus remove the objectionable condition to which the people have objected in its use. It may be found later that a sterilization equipment should be added, which can be added to the purification plant at any time desired, with small expense.

RECOMMENDATIONS AND ADVICE.

To the Council:

First. That steps be taken to put in a treatment plant to remove the iron, hardness and oil from the city water.

Second. The council should adopt an ordinance requiring water-tight receptacles for all privy vaults within a radius of a couple of blocks of the city wells.

Third. The council should pass a general ordinance requiring the cleaning and disinfecting of privy vaults at reasonable intervals, and requiring that all such privies should be screened against flies, and also providing for the disposal of slops and garbage from all residences.

Fourth. The council should immediately extend its water mains to all portions of the town not now provided with this service.

Fifth. The council should take steps to change the sewer system and disposal plant in such manner as to make both of these effective and useful and safe from a sanitary standpoint, and to extend the system as rapidly as possible for the use of the people.

Sixth. Power should be delegated to the health officer to enforce the above regulations when adopted.

To the Health Officer:

First. The health officer should see that the regulations adopted by the council are enforced and should be held responsible for the general sanitary conditions of the town.

Second. He should see to it that the privy vaults are kept in reasonably good condition and kept screened from flies and that the alleys are kept reasonably free from manure, rubbish and filth of all kinds.

Third. He should see that no water is used in any public place where it is offered to the unsuspecting public for drinking purposes without first having been tested to determine whether it is potable and safe to use. This would include hotels, restaurants, schools, etc.

Fourth. He should have supervision of all companies or parties distributing milk and see that the general sanitary conditions are maintained. He should investigate the manner of caring for the cows that furnish such milk, and require that the necessary sanitary precautions be taken to prevent the infection of the milk by the entry of germs of pathogenic diseases carried on the bodies or udders of the cows because of occupying unclean or filthy quarters or because of wading in polluted water. He should require that the milk utensils and containers should be cleansed by washing with water that is not contaminated, or which has been freed from contamination by boiling or other proper treatment.

Fifth. He should have supervision over the ice distributed in the town and see that all ice that is intended for distribution is safe and free from danger in its use.

Sixth. He should have general supervision over the food supply in all groceries, meat markets, fruit stands, etc., and see that they are furnished in a sanitary condition, which would also include the distribution of ice cream and confections.

Seventh. He should make preliminary tests upon all private wells, where request is made, to determine whether the water is safe to use or whether by the use of such water the people are endangering themselves, and to furnish such advice along this line as will be of benefit to the people generally.

Eighth. He should be alert to report any unusual conditions existing in the town, such as the recent increase in typhoid fever which your town has experienced, or any matter which might tend to increase disease or to lower the vitality of the people of the town. He should be conscientious, careful, patient and actuated with the desire to help the people of the town and to carry on a campaign of education to better the general sanitary conditions, which will mean so much to the health, happiness and wealth of the community.

The General Public:

First. Every resident should immediately connect his premises with the city water supply wherever the wells have been found to be polluted, and in such cases the old wells should be abandoned and filled up and not allowed to be used under any conditions.

Second. All privies should be kept reasonably clean and screened from flies, and care should be taken in the collecting and disposing of all garbage and waste products from the home.

Third. The kitchens and dining rooms especially should be kept well screened and free from flies, and flies should not be allowed to remain in the house, especially in the above mentioned rooms.

Fourth. That in case of sickness, especially typhoid, all dejecta from the patients should be disinfected before being disposed of.

Fifth. There should be the fullest co-operation with the health officer and every effort made to assist him in his oftentimes unpleasant and exacting duties.

Sixth. There should be a meeting together of all parties and all interests in a general campaign for the betterment of the sanitary conditions of the town. The co-operation of the council, health officer, clubs and citizens in general will bring about a condition which every citizen will appreciate and will add much to the life, health, pleasure and wealth of the community of Rockwell City.

Respectfully submitted,

(Signed) C. N. KINNEY,

Chemist, Iowa State Board of Health.

SANITARY SURVEY OF CHEROKEE, IOWA, DECEMBER, 1913-JANUARY, 1914.

This investigation was made for the purpose of determining the possible source or sources of typhoid fever. The beginning of the epidemic occurred in June and continued during September, October, November and December.

The local conditions were such as to suggest endemic origin. Two cases occurring in June seem to have no connection with preceding cases, neither do they seem to have any relation to later cases. The months of July and August were apparently practically free from typhoid.

On September 21st typhoid occurred in a family residing near the brick yard, the case being a daughter, age thirteen years. This case, apparently, recovered October 21st. In the same family a second case occurred, a daughter, eight years of age, who took to bed with the fever November 7th and recovered December 7th. A third case appeared in this family, a son, fourteen years of age, who took to bed December 17th. This family used water from a spring on the premises, and made use of milk obtained from their own cow. The sequence of the cases suggests the probability of perpetuation by contact.

A second family, of the same name, and related, the heads of the families being brothers, had the same experience. The second family resided, during the greater part of September and until October 21st, near the corner of Third and Locust street, removing on October 21st to 407 West Cherry street. At this location occurred the first typhoid case in this family, a daughter, nine years of age, who took to bed October 15th and recovered November 11th. A second case, a son, fourteen years of age, took to bed October 23d and recovered November 6th. A third case, a son, eleven years of age, took to bed October 30th. This was an easy case. A fourth case, who took to bed November 7th and died November 28th, occurred in this family, a daughter, thirteen years of age. This family made use of water from private wells at both locations and used milk from a private cow. There is a strong probability that two of these cases were contact cases, and, since the two families visited, there is a possibility that the origin of typhoid in this family may be attributed to contact with the afflicted parties of the other family. There is, however, the possibility of an independent origin of the first case of this latter family, since the water of the well used during September and the greater part of October was unfit to use, and the analysis of this water showed serious sewage contamination. This well was condemned by the local board of health.

Of the entire number of cases, twenty-three, including light and suspected cases, eight cases had practically no connection whatever with the public water supply or any dairy milk supply. Of the remaining fifteen cases, nine used milk from the same dairy, and, of these nine, six used city water and three used the water from private wells. Of the remaining six cases, two made use of the water from shallow wells and purchased their milk supply of the groceryman. One of these cases made use of both city and well water and used milk from a dairy, not the dairy that furnished the milk for the nine cases mentioned. Of the three remaining cases, one made use of a shallow well and two made use of city water, all three making use of milk from private sources.

The following table contains the date of onset, sex, and age of the cases, the water supply and milk supply:

OCCURRENCE OF TYPHOID CASES.

(Date of taking to bed used as date of onset.)

Date of Onset	Sex	Age	Water Supply	Milk Supply
June 1	Female	35 years	City	Store
June 1	Male	5 years	City	Store
September 21	Female	13 years	Spring	Private
October 15	Female	9 years	Well	Private
October 19	Male	10 years	City and well	Dairy, not X
October 19	Female	37 years	Well	Store
October 23	Male	14 years	Well	Private
October 30	Male	11 years	Well	Private
November 7	Female	8 years	Spring	Private
†November 7	Female	13 years	Well	Private
*November 13	Female	9 years	Well	Store
November following	Female	18 years	City	Unknown
November following	Male	18 years	City	Unknown
November 27	Male	10 years	City	X
*Nov., latter part	Male	13 years	City	X
December 3	Female	8 years	City	X
‡December 3	Male	54 years	City	X
December 5	Male	5 years	City	X
December 6	Female	8 years	Well	X
December 7	Female	9 years	City	X
December 7	Female	8 years	Well	X
*December 12	Male	12 years	Well	X
December 17	Male	14 years	Spring	Private

Total 23 cases.
*Doubtful cases.
†Died November 28, 1913.
‡Died December 26, 1913.
XDairy suspected of distributing the typhoid.

As is usual in such cases, considerable speculation had been indulged in by the people of Cherokee as to the cause and perpetuation of the typhoid.

From the fact that about eight of the child cases were children in the Garfield school, the opinion prevailed to some extent that in some manner the school building, or the conditions there, might be responsible for the origin and spread of the typhoid. An investigation of the sanitary conditions at Garfield school showed that there was little or no ground for such assumption.

From the fact that a large proportion of the typhoid cases had made use of city water, there was some suspicion and considerable fear that the city water supply might be responsible for the origin and spread of the typhoid.

An investigation of the city water supply, the sanitary condition of drainage areas leading to the location of the city supply, and the different analyses made, both chemical and bacteriological, indicate that the city water was not the source of transmission. The further fact that the cases were confined to a limited territory of the city also relieves the city water of suspicion. Had the city water been responsible for the typhoid the cases would have been distributed throughout the city in near relation to the distribution of the water mains. It was, therefore, evident that the transmission of the typhoid could not be charged to the city water.

The investigation of the milk supply showed that nine of the cases

occurred in six families using milk from the same dairy. The cases occurring where milk from the same dairy was used began with the first date of onset, November 27th, and closed December 12th. This represents a period of sixteen days, two of the cases appearing in November, two on December 3d, one December 5th, one December 6th, two December 8th, and one December 12th. The six families using milk from the same dairy represent only a part of the customers of this dairy, a sufficiently small part of such customers to throw doubt upon the milk supply by reason of the absence of cases among the remaining users of the same milk.

The epidemiological history of the nine cases using milk from this dairy indicates, if ages alone be considered, the probability of milk transmission, but the prodromal period existing in practically all of the cases and the actual daily run of the cases both indicate the absence of milk transmission.

The suspected dairy was visited and investigated. All of the parties concerned in the collection, the preparation or the distribution of the milk were tested as suspicious typhoid carriers, and all proved negative. The conditions in and about the barns were about the usual conditions found upon the average Iowa farm, which conditions are not as sanitary nor as safe as modern sanitarians would require. The conclusions drawn from the investigation was that if typhoid had been distributed by the milk from this dairy such typhoid infection must have reached the milk through some possible contact sources.

In explanation of such possible sources it may be understood that the sewer system of Cherokee empties into the Little Sioux river at the foot of South First street. The sewer from the state institution empties into the Little Sioux river something more than one-half mile farther down stream at a point about one-fourth mile below the outfall of the institution sewer, but at a distance of nearly a mile from the outfall of the city sewer there is located a bit of pasture land made use of by the parties who operate this dairy. The Little Sioux river is not a large stream, and the waterflow of this stream is not sufficient to safely dispose of the amount of sewage entering it. The location of the Little Sioux river is such that domestic animals, children, and even adult people, cross and recross this stream, and farm animals make use of it as a water supply. The cattle and horses belonging to the people who operate this dairy being pastured in the pasture field above mentioned would make use of the Little Sioux river as a water supply, and in so doing would wade in the river to a great extent.

Considering the amount of sewage entering the Little Sioux river from the two sources mentioned, and considering the fact that typhoid had existed from mid-summer, and also considering the fact that in a population such as use the sewers of the city there would be found many typhoid carriers, it is only fair to conclude that the Little Sioux river was and is a typhoid stream. If it be conceded that such was the condition of the Little Sioux river during the summer and fall of 1913, and that the cattle of this dairy had access to this stream, then it is entirely

possible that typhoid may have been communicated through the lodgment of typhoid germs upon the bodies of the cows, and later were deposited in the milk at the time of milking.

This conclusion is not insisted upon for the reason that the epidemiological evidence is not conclusive that the typhoid was transmitted through the milk, but had such evidence been conclusive, the investigation made would compel the conclusion that the typhoid germs entered the milk in the manner stated. Had the conclusion been reached that the typhoid was transmitted in the manner indicated, then the blame for such result would lie with the municipality which infected the waters of the Little Sioux river through the discharge of sewage into the stream, rather than upon the parties who rightfully used the waters of the stream running through their pasture land. However, the evidence was not clear that such transmission was possible, and the further investigation of this epidemic, if such it should be called, was carried on with a view to determining local unsanitary conditions existing in the city of Cherokee.

In this investigation the city water was repeatedly examined, and while not found entirely satisfactory, at no time could the conclusions reached hold the city water responsible for the transmission of the typhoid. In addition to the examination of the city water, the water of forty-eight private wells was examined. Of this number only four of the wells were found to furnish water that might be considered good. Forty-four of the wells showed sewage contamination, and more than half of these wells showed such contamination to a serious extent, and several of these wells showed sufficient contamination that it would be hard to understand why such wells had not been the source of water-borne diseases, or epidemics of the same, for a long time past. Wells contaminated, as these were shown to be, are liable at any time to become infected with the germs of water-borne diseases.

The conclusions reached in this investigation are:

First. That the existence of typhoid fever at Cherokee in the summer and fall of 1913 must be attributed to endemic rather than epidemic origin.

Second. That the private wells, in their polluted and contaminated condition, are a constant menace to the health of the people of Cherokee, and that the water of such wells is liable to infection by the germs of water-borne diseases at any time.

Third. That the conditions responsible for the existence and perpetuation of typhoid must be corrected in order to prevent the recurrence of typhoid.

Fourth. That the use of private wells must be abandoned, and that the sewage of the city must be purified before the same is discharged into the Little Sioux river.

This investigation reveals the same conditions at Cherokee as exist in many of our smaller cities and towns. It is idle to seek to place the entire blame upon distributors of milk and food products, when the conditions under which such foods are produced make the safe production of such food a practical impossibility, and here it is again illustrated that

unsanitary conditions and improper practices are the source and perpetuation of contagious and infectious diseases.

This investigation was made by the civil and sanitary engineer and the chemist of the state board of health, at the request of the secretary-executive officer of the state board of health, and with the co-operation of the local board of health of Cherokee.

INVESTIGATION OF TYPHOID EPIDEMIC NEAR DEDHAM, IOWA, MARCH, 1914.

On or about January 30, 1914, a church supper was held at the home of J. F. Miller, five and one-quarter miles south of Dedham. There were in attendance at this church supper about one hundred and fifty people, old and young.

The supper was an oyster supper. Fresh oysters in gallon cans were furnished by a meat dealer in Dedham, the oysters having been ordered from the Booth Company at Omaha. Celery was also eaten at this supper. Ten cans of oysters were ordered, six of which were used at the supper.

The greater number of those present used water for drinking, but some of the people present made use of coffee.

Of those who partook of the supper twenty-two were attacked with typhoid fever, or what would seem to be typhoid fever. It is possible that a few of the cases were not typhoid fever, but nearly all of the cases were considered typhoid by the attending physician. In a few cases Widal tests were made, which were positive, but in the majority of the cases only clinical diagnosis was made. The twenty-two cases occurring means that one person out of six eating at this supper had typhoid fever.

It was at first believed that the oysters were the source of the typhoid infection. A careful investigation of the preparation of the supper revealed the fact that there was little chance for the transmission of the typhoid infection from the oysters. The milk used in the preparation of the oysters was kept constantly hot, and practically at the boiling point. The oysters were also subjected to a high degree of heat, and for a considerable period of time, this heat reaching the cooking point frequently during the time of the supper. The milk and the oysters were kept separate in the preparation, and the oysters placed in the milk at the time served. The investigation of the preparation of the oysters warrants the conclusion that the oysters were not the source of the typhoid infection.

There is one possibility in connection with the handling of the oysters. The oysters were received by the dealer, packed in foul ice. The investigation was made about seven weeks after the time of the supper. There was no opportunity to analyze the particular ice in which the oyster cans had been packed, except that, according to the statement of the dealer, the ice had not been emptied out of the box in which the cans were kept.

He had ordered subsequent shipments of oysters and all of these had been placed in the same receptacle. The oysters all came from the same company at Omaha, and were, presumably, packed in the same kind of ice. A sample of this ice, or ice water, in the ice box in which the oyster cans had been packed, when analyzed showed a heavy sewage content and showed the presence of colon bacilli in large quantity. The dealer stated that the cans, when taken from this receptacle, carried considerable ice sticking to the outside of the cans; that the cans which were taken to the farm home were placed in the buggy without freeing the outside of the can from ice. The weather was sufficiently cold to maintain the ice upon the cans until the same were opened at the supper. There is a possibility that some infection contained in the ice may have found its way into the water used in washing the plates used at the supper.

There was a scarcity of water at the farm home, due to the fact that the cistern which held the farm supply had been cleaned out the day before and was not usable. The greater part of the water used at the supper was carried from a nearby farm well, and such water as was used for washing dishes at this supper was saved as much as possible, and there is a possibility that infection may have reached the dishes from the ice washed from the outside of the cans just before the oysters were placed in the warming vessel. This is spoken of as a possibility only, and is not believed from the evidence obtainable to have been probable.

In support of the conclusion that the oysters as prepared did not transmit the infection, it may be stated that four gallon cans of the oysters were returned unused to the dealer, who sold these oysters to the residents of Dedham in small lots, by pints and quarts, within four days from the time of their return to the dealer. Since these were fresh oysters no doubt a considerable portion of the amount returned were eaten as such, or with little or no cooking, and since the immediate danger of typhoid from fresh oysters lies in the fact that they may be eaten without sufficient cooking, and from the further fact that no infection resulted in Dedham from the use of the four gallons returned, it would seem that there was no typhoid infection in the oysters.

The celery used at this supper was ordered from a nearby town, but it was not possible to determine whether infection may have occurred from the use of the celery. The evidence seems to indicate that the celery was not generally eaten by those partaking of the supper, and the probability of the infection coming from this source is considered negligible.

The history of the cases seems to indicate that those who drank coffee at the supper, or did not drink water, escaped the infection, and it also seems to be true that all of those who received the infection used water as their drink at the meal. All of the water so used came from a well located on a nearby farm.

The following table of the cases seems to furnish evidence of a water-borne infection:

TYPHOID CASES RESULTING FROM CHURCH SUPPER HELD JANUARY 30, 1914.

No. of Case	Sex	Age	Date of Onset	
1	Female	16	February 17	Case light
2	Female	16	Unknown	Died March 8
3	Male	14	February 17	
4	Female	32	February 19	
5	Female	18	February 19	
6	Female	10	February 19	
7	Female	12	February 19	
8	Male	18	February 19	
9	Male	17	February 19	
10	Male	42	February 19	
11	Male	45	February 19	Case light
12	Female	20	February 19	
13	Female	17	February 19	
14	Female	17	February 22	
15	Female	38	February 26	
16	Female	21	February 26	Case light
17	Male	16	February 26	
18	Male	20	February 27	
19	Male	14	February 27	
20	Female	16	March 2	Case light
21	Male	60	March 3	
22	Male	23	March 9	

From the above table it will be noted that the cases run from the age of ten to the age of sixty. It will also be noted that even with the first cases the period of incubation is long. It is also a part of the epidemiological history that practically all of the cases had long prodromal periods. When all of the facts are taken into account the reasonable conclusion is that the typhoid was water-borne.

Having reached this conclusion, the next inquiry is as to the source of the infection. As previously stated in this report, the water supply at the Miller home was practically out of commission. The water used for drinking and for the greater part of the work of preparation of the supper was carried from the well of a nearby farm. The family occupying this farm attended the supper. Two of the three children attending the supper were attacked by the fever, one of these having typhoid in light form and the other having the fever in serious form. The fact that these children came down at an early date with the fever would indicate, but would not fix, the certainty of the infection in the water from the well located at this home.

An examination of the water of the well revealed a bad condition, showing sewage contamination. Colon bacilli were found in considerable quantity. However, the water from this well is the water that was used at the supper by all of those who drank water instead of coffee at the supper. Referring again to the fact that all who were attacked by the fever drank of this water at the supper, we seem to have sufficient circumstantial evidence to place the water under grave suspicion.

A sanitary survey of the premises on which this well is located showed that the outdoor toilet was situated about sixty feet from the well. The well is a bored well about sixty feet deep and walled with tile eight

inches in diameter. The surroundings of the well were unsanitary. The ground was sufficiently flat and sloped sufficiently toward the well to promote the percolation of surface water bearing surface contamination directly toward and probably into the well.

An early winter thaw, accompanied by rain, gave opportunity for seepage from the vault of the toilet to percolate into the well. This open condition of the ground occurred several weeks before the time of the supper, and sufficient time intervened whereby typhoid infection existing in the vault of the toilet might find its way into the well and thus infect the water of the well within a few days of the time of this supper at which the water of this well was used.

These facts are all circumstantial, but the reasonable conclusion to be reached is that this water was capable of transmitting the germs of typhoid fever, and, if so, the use of this water at the supper furnishes the most reasonable explanation of the transmission of the typhoid bacilli.

As previously stated, two of the children living at this home were victims of the infection. However, the onset of both of these cases was February 17th, two days prior to the onset of the majority of the cases. While it might be true that these children received the infection at the supper, may it not be true that the infection of these cases was received prior to the time of the supper and from the previous use of the water from this well.

The conclusion is, therefore, reached by the engineer of the state board of health, who made this investigation, that the infection transmitted at this supper was water-borne, and was probably transmitted by the water from the nearby farm well, which was used almost entirely as the water supply in the preparation of the supper and for drinking purposes during the supper.

It would seem that an occurrence of this kind must necessarily be extremely rare, but the occurrence only illustrates that rural localities may be subjected to unexpected and violent epidemics of typhoid fever and from causes that bear definite relation to lack of care and proper sanitary precaution.

INVESTIGATION OF EPIDEMIC OF TYPHOID FEVER AT BARNES CITY, IOWA, MAY, 1914.

(Note: The following report of the investigation of the epidemic of typhoid fever at Barnes City is printed in practically complete form. It was desired that this report should be printed in full for the reason that many of the towns of Iowa are about in the same condition as Barnes City with reference to modern sanitary installations. The unfortunate epidemic of typhoid fever which occurred at Barnes City might easily be duplicated in similarly situated towns with little warning to the residents thereof. The report shows the care that has been taken in making a complete sanitary survey of the town. A copy of this report was sent to the Mayor and Town Council of Barnes City, and the recommendations contained therein have been followed out in good faith by the local board of health so far as it was in their power to comply. The sanitary precautions taken by the local board of health of Barnes City and the residents of the town have prevented a recurrence of typhoid fever. In the report as herein printed the names of all Barnes City people affected by this report have been omitted, but the facts have been maintained and the purpose of the report accomplished.)

To the Iowa State Board of Health,

Guilford H. Sumner, Secretary-Executive Officer.

I herewith submit a report of the investigations made, by your direction, at Barnes City, Iowa. This report includes:

(a) A sanitary survey of Barnes City, Iowa, made by Lafayette Higgins, sanitary engineer.

(b) Epidemiological investigation and bacteriological analyses of Barnes City wells, made by A. M. Alden, assistant bacteriologist of the state board of health.

(c) Field tests of the wells of Barnes City, by Gharrett Jordan, assistant chemist of the state board of health.

(d) Sanitary analyses of wells of Barnes City, by C. N. Kinney, chemist of the state board of health.

(e) Conclusions and recommendations.

The study of the typhoid epidemic at Barnes City, Iowa, which made necessary these investigations, was begun by Mr. Alden on the 15th day of May, 1914. The sanitary survey of Barnes City was begun by the sanitary engineer May 23, 1914. The field investigations and chemical analyses immediately followed, and the final work of the sanitary engineer will be done after this report is filed, the recommendations considered, and final instructions given by the state board of health, or its executive officer.

The investigation by Mr. Alden includes the history of about eighteen cases of typhoid fever and the analyses of water from eleven different wells at Barnes City.

The field investigation by Mr. Jordan includes analyses of approximately one hundred wells, all of the wells in Barnes City, the location of cess pools used as a means of sewage disposal, and a study of surface conditions and drainage areas.

The work of the state chemist is the analysis of thirteen samples from the wells of Barnes City.

The work of the sanitary engineer includes the field survey, a study of drainage conditions affecting the domestic water supply, the preparation of a map showing drainage conditions, the approximate location of wells, cess pools, and the location of typhoid cases.

The history of the typhoid epidemic is almost entirely given in Mr. Alden's report. The sanitary survey is made up almost entirely of the work of the sanitary engineer and the chemists of the state board of health.

(a) The accompanying map of Barnes City, Iowa, if carefully studied, will convey a great deal of information concerning the sanitary condition at Barnes City. Every well in Barnes City is located upon this map, and the analyses and history given in the report of Mr. Jordan is tabulated and included herewith. The investigation of these wells was a necessity, for the reason that Barnes City has no municipal water supply. The town wells, which are simply street wells used by the public, have been analyzed by the bacteriologist and the chemist of the state board of health, and your attention is directed to these analyses, herein appended, which show conclusively that these wells are badly contaminated and could be, and probably are, the means of disseminating water-borne diseases.

A careful study of the tabulated analyses of the wells of Barnes City reveals a condition that must be corrected by this municipality in the near future. The usual conditions are found in this town. Practically

every town in Iowa from thirty to fifty years old will exhibit similar conditions. The pollution of wells in such towns is little understood by the people. When sickness occurs from a water-borne disease it is quite common for the attending physician to charge the disease to the water of the well used by the patient, and in many cases the physician is correct in this conclusion. In such cases, however, the attending physician or health officer sends in a sample of the water of this particular well for analysis, and in most cases such water is found to be bad and capable of transmitting the disease. This leads to the condemnation of this particular well, but nothing whatever is usually done in the analysis of nearby wells or of many wells of the locality. In this case the people who own the well and the people of the town come to believe that the *one* well or the *few* wells used by the people afflicted are the only wells in town that are thus contaminated, and these wells are condemned and put out of commission, while the other wells of the town, which are probably equally contaminated, are considered to be safe. The absurdity of such conclusions is evident, and it is for the purpose of determining the real condition of the water supply that I have insisted upon a complete survey and test of all the wells in any town where it is necessary to make these investigations.

I think it will be evident, when you study the included report on the wells of Barnes City, that this comprehensive survey is essential.

We are informed that Barnes City has not been free from typhoid fever for several years past, that each autumn, for at least four years, there have been several cases of typhoid. In the present epidemic it appears to have been continued from the typhoid cases of last autumn. But there have been enough cases each year to have been the cause of serious alarm, and it seems unbelievable that a town of this size, about four hundred people, should have several cases of typhoid fever without feeling alarmed and taking the necessary steps to stop it. Evidently the typhoid has existed here for a long period of time, and it only required the proper conditions to make it epidemic. Barnes City is simply one of the many towns in Iowa that are now reaping the results of improper and imperfect sanitary precautions.

A study of the map will show that the surface drainage of Barnes City flows through and across a portion of the residence district. The study of the map will further show that the typhoid fever cases are so related to this overflowed district, and to the natural drainage, that one is compelled to conclude that there must be existing here the relation of cause and effect. A number of wells are so located that a considerable part of their water supply is the drainage or overflow water of the town, which carries the surface pollution into the area drained by these wells.

There is one feature of this survey that one cannot ignore. There is indicated upon the map a certain privy, or outside toilet, situated near the rear of the store building located on the southeast corner of block 10. The following history of this toilet was obtained from citizens of Barnes City by Mr. Jordan: "The Privy Over the Old Well." "The old well was originally back of a livery stable and was originally about twelve feet deep, then they dug it to about thirty feet. The livery stable burned down and they think the well was partially filled with the refuse and with

BARNES CITY, IOWA.

1 INCH = 400 FT.

MAY, 1914.

LEGEND:-

Wells marked ● and numbered
Cess Pools marked ⊕
Location of Typhoid cases shown by crosses (+) and large circles enclosing. These cases carry numbers: 1, 2, 3, etc, given by Mr. Alden.

N

Note:- Privy shown on Lot 21, Block 10 uses abandoned well as vault. This is practically a public toilet and has been so used for several years.

Poweshiek Co

County Line

CORPORATION LINE

Mahaska Co.

DEPOT

C.R.I.&P.RY.

VINE ST.

SPRUCE ST.

PINE ST

DRUSE ST.

SCHOOL

Public Privy

Local No. 2

Brain for cess-pools

Tile

Draw

Draw

Draw

Creek

CHERRY

BROADWAY

ELM

S.B. WELLS

CORPORATION LINE

rock, but they are not sure. The store was built thirteen years ago and the privy was built over the well. Last fall they put about a barrel of lime and some ashes in it, and this spring they put in another barrel full. The land slopes a little to the southeast. Filled now up to about three feet from the top."

Here we have a condition that must be taken into account. This old well was right at the head of an old draw, which was the starting point of drainage in that part of the town. To the southward this draw ran through a wet or marshy portion of the town as it existed earlier. Some tiling was done in this draw, and I was told that the continuation of this tiling into a main tile drain was made about a block south of this well. It also appears that the main tile of this drainage system ran within a few feet of the well numbered "95" in the schedule and on the map. This is the well belonging to the family in which occurred the first case of typhoid fever, December 1, 1913 (well No. 12 of table).

Taking into account that this toilet, which was really a public toilet, is situated in the very location that would enable it to pollute the underground water of this draw, taking into account the fact that the well was not filled up or cemented in a manner to prevent the contamination of the water at its base, and taking into account that any drainage, surface or underground, from this point travels rapidly down the ravine, hastened in this by the tiling previously laid to drain this wet locality, we must conclude that the well numbered "95" would receive, and did receive, such pollution as would be provided by this toilet. Then add to this the fact that this toilet is a public toilet and we have all the conditions necessary to account for the existence of this first case of typhoid fever occurring December 1, 1913. There is little doubt that analyses of this well last December would have definitely decided this question. The chemical analysis of this well was made by the chemist during this investigation and is contained in the list of sanitary analyses. Well No. 8 analyzed by the bacteriologist and the chemist, and which is located in this same locality, is found seriously contaminated. Mr. Alden's records show that this well is the well used by the family in which the typhoid fever started on April 6, 1914. Again an examination of the map shows that the well belonging to the man who took the fever April 15, 1914, is located close to this ravine into which this surface and underdrainage runs.

It is simply impossible to disregard the significance of these conditions. No amount of reasoning will eliminate from consideration the possibility and probability of this public toilet, with its certain contamination of the rapidly moving underground water reaching the wells we have mentioned, being one of the principal causes, if not the principal cause, of the present epidemic of typhoid fever in Barnes City. It may be mentioned also that there are two periods in the year when such a drainage basin as here exists will be carrying a quickened underflow; in the late summer or autumn, when the rains are heaviest and most frequest, and in the springtime, when the frost leaves the ground and the spring rains occur. The date, December 1, 1913, when the first case occurred, and the next cases occurring in April, 1914, seem to corroborate the probability of the origin of the typhoid in Barnes City.

The sanitary survey reveals the existence of a few cess pools used as private sewage disposal plants. The location of these does not indicate that these installations have entered into the serious pollution of the water of the wells. However, it would only be a question of time, in the absence of a sewer system, when a large number of these would be installed, and such installations would then seriously pollute the water supply of the wells just as such installations have afforded serious pollution of the wells in other towns of Iowa.

I now append the reports of Mr. Alden, Mr. Jordan and Mr. Kinney.

(b) EPIDEMIOLOGICAL INVESTIGATION OF TYPHOID EPIDEMIC AT BARNES CITY, IOWA.

BY A. MAXWELL ALDEN, ASSISTANT DIRECTOR BACTERIOLOGICAL LABORATORY OF IOWA STATE BOARD OF HEALTH.

On May 15th, at the request of Dr. Sumner, I went to Barnes City to investigate the typhoid situation there. I was met by the mayor, Mr. Sarvis, and Drs. Day and Farrell, who gave me every assistance possible in securing information concerning the cases of typhoid in Barnes City, and the general sanitary conditions of the town. I received complete histories of seventeen cases of typhoid which have occurred since December 1, 1913, and collected samples of water from eleven of the most suspicious wells.

An epidemiological study of the seventeen cases of typhoid fever occurring in Barnes City since December 1, 1913, shows several striking facts.

The first case occurred December 1, 1913. The second case came down about Christmas. There were no new cases then until late in March, after which fifteen cases developed within four weeks.

The following table shows the principal facts derived from the histories of the typhoid cases in Barnes City:

No.	Age	Sex	Date of Onset	Source of Milk Used	Water Used
1	36	Male	April 6, 1914	+	Well water
2	32	Female	April 30, 1914	+	Well water
3	2	Female	April 10, 1914	+	Well water
4	†				
5	43	Male	April 28, 1914	+	Well water
6	48	Female	April 28, 1914	+	Well water
7	2	Female	April 7, 1914	+	Well water
8	4	Male	April 15, 1914	+	Well water
9*	25	Male	April 7, 1914	+	Well water
10	22	Female	May 1, 1914	+	Well water
11	3	Male	December 26, 1913	—	Well water
12	20	Male	December 1, 1913	—	Well water
13	25	Male	April 12, 1914	—	Well water
14	7	Female	April 14, 1914	—	Well water
15	35	Male	April 15, 1914	+	Well water
16	23	Female	April 15, 1914	+	Well water
17	14	Male	April 1, 1914	+	Well water
18	16	Male	April 12, 1914	—	Well water

†Case uncertain.
*Died May 7, 1914.
NOTE: +Drank milk from same supply.
—Drank milk from different supplies.

By referring to the above table, it will be seen that only five of the patients were below ten years of age. The remainder of the ages ranging from fourteen to forty-eight. As to sex, there were ten males and seven females affected. In other words, the infection was not confined to any particular age or class of individuals, but was evenly distributed as to age and sex.

By a study of many epidemics of typhoid fever, it has been found that the principal sources of infection are milk, water, contact, flies and fresh vegetables. Inasmuch as this outbreak occurred in the very early spring, we can eliminate flies and vegetables. This leaves three possible sources of infection, namely, milk, water and contact, and I shall briefly take them up in the order named and consider the part played by each in the Barnes City outbreak.

Milk. At a first glance, the fact that all but five of these seventeen cases admitted drinking milk obtained from the same source appears significant. However, a closer examination shows the following facts:

First. Neither of the first two cases that developed used this milk supply.

Second. There has never been a case of typhoid in the milkman's family, nor, so far as we were able to determine, in the family of anyone who worked for him in his house.

Third. Although a large per cent of the total number of cases used milk obtained from the same milkman, only a very small per cent of this number of customers developed typhoid.

Fourth. The milkman's residence is on a hill where he does not receive the drainage from town and the general sanitary conditions around his place are very much better than the average. Also, a bacteriological analysis of the water from his well shows no evidence of sewage pollution and a very low total bacterial count, considering the fact that it is a dug well.

In a milk-borne epidemic, we would expect a large proportion of the cases to be among infants and small children, who are the principal consumers of milk. In this epidemic, this is not the case, for a large majority of the cases were among adults.

From the above evidence we must conclude that the milk was not the cause of the outbreak of typhoid fever in Barnes City.

Water. The situation of Barnes City, as regards water supply, has been so thoroughly covered by the reports of Messrs. Higgins, Jordan and Kinney that I shall devote very little time to this phase of the question. The history of the cases, taken together with the analyses of the shallow wells, leaves little doubt that a large proportion of these cases of typhoid received their infection from the use of well water.

Contact. While it is true that the primary source of typhoid in Barnes City was undoubtedly in the water supply, the part played by contact in this outbreak must be taken into consideration. There are four cases that were probably contact cases and several more that come within the range of possibility. We must qualify our statement here and say that these cases were probably caused by contact rather than state it as a positive fact, because in the families in which they occurred all the members were exposed alike to the primary source of infection.

Case No. 2, following, as it did, three weeks after cases 1 and 3, was undoubtedly a case of this kind, for the woman in question helped to nurse the other two cases. Case No. 10 was developed under the same conditions, the woman of the house having nursed the other two patients and, after a little more than the normal period of incubation passed, developed the disease herself. Cases 5 and 6, in all probability, came the same way, following No. 7, as No. 6 nursed No. 7, at the same time preparing food for herself and No. 5.

So, in summing up the matter, we may eliminate all sources of infection, except water and contact, and say that the outbreak of typhoid in this case was primarily due to the use of water from shallow wells which received surface drainage, and that contact was only instrumental in making the infection more wide-spread, and, in this manner, acted as a secondary, though equally important, cause.

BACTERIOLOGICAL ANALYSES OF WATER FROM BARNES CITY, IOWA.

BY A. M. ALDEN, ASSISTANT BACTERIOLOGIST OF THE IOWA STATE BOARD OF HEALTH, MAY 21, 1914.

Alden's Number	B. Coli.	Litmus Lactos Agar. Colonies per cc.	Total Count Colonies per cc.
1 (45)	—	39	54
2	+	480	1460
3	—	340	1280
4	+	621	2600
5	—	14	734
6	—	36	422
7	+	61	2300
8	+	830	3700
9	+	610	4100
10	—	30	640
11	—	21	78

(Signed) A. M. ALDEN.

NOTE—Mr. Alden's numbers are the same as the list numbers except No. 1, which is No. 45 of the list.

(c) FIELD TESTS OF WELLS AT BARNES CITY, IOWA, MAY, 1914.

These tests were made by Gharrett Jordan, assistant chemist of the Iowa State Board of Health.

State Standards:—Chlorine 3.50 parts per million.
(Shallow Wells) Nitrites .00010 parts per million.

Serial No. of Sample	Chlorides Parts per Million	Nitrites Parts per Million	Pollution Indicated by permanganate test	Physical and microscopical tests	Name of owner and history of well
2	295.0	Trace	Medium		SW town well. Bored well 15"x30'. Cement top. Privies 100'. Do not use well for drinking.
3	6.0	.00020			New dug well 30'. An 8" hole drilled about 10' Large board top. Well 15' from house, 60' from privy. Drain for laundry 15' from well. Hog lot 15' from well. Land slopes from well toward hog lot. Rather dirty surroundings.
4	34.0	Trace			Dug brick well 35'. Cement top, good condition. Cemented 2' down. Privy 90'. Land level. Surroundings fair.
5	85.0	.00025			Depot. Public well. Dug 24'. Top fair. Privy 125'.
6	9.25	.00005			Lumber yard. Bored well 8" x20'. In shed. Fairly good board top. Drain from box to street. Level part of town.
7	32.50	.00050			Garage well. Inside of garage. Cement top. Condition good, 100' to nearest privy. Level ground.
8	25.15	.00015			Bored well. Board top, in fair condition. Barn 35'. Privy 90'. Land slopes a little from privy to well. Surroundings in fair condition.
9	85.0	.00200	Heavy		SE town well. Dug 25'. Large cracks in board top. 90' to privy. Do not use well for drinking purposes.
10	3.0	.00025			New dug well 22' deep in barn lot. Fair board top. Barn and privy 100'. Land slopes from barn to well. Land on two sides slopes to well. Surroundings dirty.
11	13.0	.02500			Bored well 38' deep. Cracks in board top. Privy 75'. 20' to house. Land level. Condition fair.

NOTE—Wells are indicated on map as follows ●², etc., and are numbered consecutively.

Abbreviations: af—animal forms; a—algae; c—colorless; b—brown; g—green; Fe—iron; sm—small; cons—considerable; sl—slightly.

FIELD TESTS OF WELLS—Continued.

Serial No. of Sample	Chlorides Parts per Million	Nitrites Parts per Million	Pollution indicated by permanganate test	Physical and microscopical tests	Name of owner and history of well
12	287.5	.00090	Medium heavy	g.a.	Dug well 18′. Board top tight. 50′ to privy. Condition fair Case of typhoid. Patient 19 years old.
13	22.5	.00015	Medium heavy	sm. af. ga.	Dug well 26′ deep. Tops in poor condition. 40′ to barn and privy. Condition fair.
14	3.0	.00005	Medium heavy	Few af. B. and ga.	Dug well 21′. Top low. 100′ to privy. Condition fair.
15	28.0	.00010	Medium heavy	ga. sediment white flakes.	Dug well 25′ Top open, about even with ground. 100′ to privy. Condition fair.
16	32.5	.00300	Heavy	Cons. Fe, filled a. Large af. Turbid. Cons. Fe. precipitated.	Dug well 24′. Top low and open. 100′ to privy. Condition fair.
17	22.5	.00005	Medium heavy		Dug well about 25′ deep. Well top fair. 100′ to privy. Condition fair.
18	2.5	.00005	Medium	Cons. b and c.a.	School house well. Dug 25′. Top tight. About 150′ to privy. Condition fair.
19	75.0	.00035	Medium heavy	Few sm. af. g.a.	Bored well about 25′ deep. Cement top. Barn and privy 36′. Condition good.
20	29.0	.00085	Medium heavy	Few sm. af. c. and Fe. filled a. Turbid Cons. fe. precipitated.	Bored well about 25′ deep. Top level with ground. Privy 50′, barn 60′. Condition good.
21	23.5	.00100	Heavy	Cons. sm. af. Cons. Fe. filled a. Sl. turbid.	Bored well about 25′ deep. Well top fair. Barn and privy about 150′. Condition good.
22	40.0	.00015	Medium	B. and g.a. Few sm. af. Some Fe. precipitated.	Dug well about 25′ deep. Low open top. Privy. Condition fair.
23	9.5	.00015	Medium heavy	Cons. b.a. Few sm. af.	Bored well 25′ deep. Cracks in top of curb. About 50′ from one privy and 26′ from another, which was moved this spring. Other conditions good.
24	1.5	.00008	Medium heavy	Cons. b. and c.a. Few sm. af. Sl. turbid.	Bored well 8″x26′. Large cracks in cover. 50′ to privy. Conditions fair.
25	1.5	.00008	Medium	Some ga. sm. af.	New dug well 3½′x30′. 3′ cement top in good condition. About 3′ from old well. Privy 70′. Condition fair.
26	1.0	.00040	Medium	Some ga. Few af.	8″ bored well. Conditions around well poor.

FIELD TESTS OF WELLS—Continued.

Serial No. of Sample	Chlorides Parts per Million	Nitrites Parts per Million	Pollution indicated by permanganate test	Physical and microscopical tests	Name of owner and history of well
27	2.0	.00005	Medium heavy	Little g.a. Sl. turbid. Sediment, white flakes.	Well 2′x35′. Cement top. In fair condition. 75′ to cess pool. About 40′ to underground carbon light tank. Tile drain run within a foot of cess pool and then north to R. R. draw.
28	8.0	.00015	Medium	C. and g.a.	Bored well 35′x15″. Good top level with ground. New property.
29	9.0	.00010	Small	Some g.a. Few sm. af.	Dug well 2½′x30′. Top poor. Level with ground. Privy 75′.
30	5.0	Trace	Medium	Sm. g.a.	Bored well 8″x25′. Top low. Cave 10′ from well. Privy 75′. Conditions fair.
31	20.0	.00010	Medium heavy	B. and g.a. Some Fe. sediment.	Dug well 3′x35′. Fair board top. Privy 75′. Conditions fair.
32	4.5	.00005	Medium heavy	Cons. b.a. Cons. sm. af. Some sediment.	Well No. 2. Dug 3′x32′. Board top in fair condition. Privy 75′.
33	5.0	.00020	Medium heavy	Cons. b. and g.a. Sediment.	Bored well 22′ deep. Top level with ground and in poor condition. Privy 100′.
34	2.0	.00075	Medium heavy	Little b.a.	Bored well 15″x30′. Cement top in good condition. Privy 75′.
35	16.0	.00010	Medium heavy	Little c.a.	Bored well 8″x26′. Board top in fair condition. Privy 75′ to 80′. Condition fair.
36					
37	13.0	.00025	Medium	C.a.	Dug well 3′x36′ in good condition. High top. Privy 100′.
38	11.0	Trace	Medium	C.a.	Dug well 30′ deep. Top fair. Privy 70′. Land slopes away from well, which is used by two families.
39	60.0	.00010	Medium	C.a. Few sm. af.	Dug well 3′x28′. Board top fairly tight. Privy 75′.
40	37.5	.00010	Medium	B. and c.a.	Bored well 8″x20′. Well top even with surrounding ground and in fair condition. Privy 75′. Condition fair.
41	4.5	.00015	Medium	Cons. b. a. Fe. filled a.	Deep bored well. Cement top in good condition. Privy 70′.
42	3.5	.00005	Medium	Little b.a.	Bored well 30′ deep. Privy 75′. Condition of well only fair. Surroundings fair.

FIELD TESTS OF WELLS—Continued.

Serial No. of Sample	Chlorides Parts per Million	Nitrites Parts per Million	Pollution indicated by permanganate test	Physical and microscopical tests	Name of Name of history of well
43	5.0	.00010	Medium	B.a. Few sm. af.	Bored well 16″x30′. Board top in poor condition. Well in fair condition. Privy 100′.
44	15.5	.00010	Medium	C.a. Few sm. af.	Bored well 15″x30′. Condition fair. Board top fairly tight. Privy 100′.
45	4.5	.00010	Small	Some b.a.	Bored well 30′ deep. Cement top. Cistern 12′ from well. Inside toilet. Drain running east to draw.
46	2.0	.00065	Medium	Cons. c.a. Some b.a.	New bored well 15″x32′. New top in good condition. Privy 40′. Condition clean.
47	4.5	.00010	Medium		Bored well 15″x30′. Cement top. Inside closet. Sewer connects with No. 45. Condition good.
48	14.0	.00010	Medium	C.a.	Dug well 34′ deep. High top in fair condition. Privy 70′.
49	22.5	.00005	Medium	Little c.a. Sm. a.f.	Dug well. Depth not known. Top in fair condition. Privy 110′. Condition fair.
50	15.5	.00350	Medium heavy	Few af. Sl. turbid.	Dug well 3′x22′. Cement top in good condition. Privy 100′.
51	9.0	.00150	Medium heavy	B. and g.a. Fe. filled a. Sl. turbid sediment.	Bored well 15″x30′. Well top only fair. Privy 150′. Condition fair.
52	3.5	.00005	Medium	Some g.a.	Bored well 8″x27′. Cement top. Privy 75′.
53	3.5	.00015	Medium	Fe. filled a. Some sm. af.	Bored well 8″, depth not known. Board top fair. Privy 100′. Condition fair.
54	7.0	.00010	Medium heavy	Fe. filled a. Some sm. af. Sl. turbid.	Bored well 8″, depth not known. Good board top. Privy 100′.
55	7.5	.00150	Medium heavy	Fe. filled a. Some sm. af. Turbid. Sandy sediment.	Bored well 15″x40′. New top, fair condition. Privy 125′. Fair condition.
56	3.5	.00010	Medium		Dug well 3′x38′. Board top in fair condition. Privy 100′. Condition fair.
57	44.0	.00200	Medium heavy		Depth of well not known. Top in fair condition. Privy 40′.
58	18.0	.00010	Medium		Dug well. Depth not known. Top in good condition. Privy 50′.
59	15.0	Trace	Medium		Dug well 35′ deep. High board top, cracked. Condition of well good. Privy 40′.

FIELD TESTS OF WELLS—Continued.

Serial No. of Sample	Chlorides Parts per Million	Nitrites Parts per Million	Pollution indicated by permanganate test	Physical and microscopical tests	Name of owner and history of well
60	8.5	Trace	Small		Board top with open cracks. Privy 70′. Condition fair.
61	26.0	.00035	Medium heavy		Board top good. Privy 100′. Fair condition.
62	16.0	.00025	Heavy		Bored well, depth not known. Board top in fair condition. Privy 100′.
63	18.0	.00025	Heavy	Large af.	Board top fairly tight. Privy about 125′. Case of typhoid here four years ago.
64	12.0	.00005	Medium		Good board top. Privy 90′. Condition good.
65	6.5	.00010	Medium		Well dug and bored about 35′ deep. Board top in good condition. Privy 80′. Condition fair.
66	75.0	.00035	Medium heavy		Board top tight. Privy 100′. Condition fair.
67	12.0	None	Medium		Bored well 35′ deep under porch. Privy 125′. Condition fair.
68	16.5	.00010	Medium		8′ bored well. Depth not known. Cement top. Privy 120′. Condition good.
69	•29.0	.00020	Heavy		Dug well. Depth not known. Cracks in board top. Privy 120′.
70	17.0	.00005	Heavy		Well has cement top. Privy 125′. Condition good.
71	40.0	.00040	Medium heavy		Dug well. Depth not known. Privy 50′. Condition fair.
72	34.0	Trace	Medium		Dug well 3′x27½′. Board top. Privy 125′. Condition good.
73	8.0	.00015	Medium		Dug well 30′ deep. Top low and cracked. Privy about 125′.
74	65.0	.00035	Medium		Bored well 15″x40′. Top good. Privy 100′. Condition fair.
75	8.0	.00025	Medium		Well dug 35′ deep. Good top. Privy 60′. Condition good.
76	5.0	None	Medium		Tile well 10″x24′. Top of well tight. About 80′ to privy. Condition.
77	3.0	.00005	Small		Dug well 30′ deep. Board top fair. Privy 100′. Condition good.
78	2.5	.00035	Medium		Dug well. Board top fair. Privy 125′. Condition fair.
79	16.0	.00150	Medium heavy		Bored well 15″x37′. Top good. Privy 100′. Condition good.

FIELD TESTS OF WELLS—Continued.

Serial No. of Sample	Chlorides Parts per Million	Nitrites Parts per Million	Pollution indicated by permanganate test	Physical and microscopical tests	Name of owner and history of well
80	15.0	.00005	Medium		Dug well 3'x33'. Well top in good condition. Privy 50'. Condition good.
81	120.0	.00100	Medium heavy		Dug well. Plank top fair. Privy 80'. Condition good.
82	18.0	.00015	Medium		Dug well. Plank top fair. Privy 80'. Condition gaad.
83	9.0	.00010	Medium		Dug well. Plank top fair. Privy 120'. Condition fair.
84	5.5	.00005	Small		Bored well 20", depth not known. Well under porch. Privy 45'. Condition good.
85	47.00	.00900	Very heavy		Bored well 8"x31'. Privy 60'. Ice cream factory here for 3 years. Well dug 4' from place where they throw water. Restaurant.
86	4.5	.00010	Medium		Bored well 16"x40'. Top in good condition. Privy 40'. Condition good.
87	4.0	.00010	Medium		Bored well 16", depth not known. Top in good condition. Inside closet. Drains run to west draw.
88	11.0	None	Medium		Bored well 8"x20'. Top in good condition. Inside closet. Drains run to west draw.
89	4.0	None	Small		Dimensions of well not known. Top good. Inside closet. Drains run to west draw.
90	5.0	None	Small		Bored well 8"x23'. Top good. Privy about 125'. Condition good.
91	3.0	.00010	Small		Bored well 15"x30'. Top good. Privy 100'. Condition good.
92	3.0	.00005	Small		Bored well 15"x37'. Well top good. Privy 60'. Condition good.
93	27.0	.00075	Medium		Dug well 35' deep. Cement top. Privy 40'. Condition good.
94	3.0	.00015	Medium		Bored well 10", depth not known. Top good. Privy 100'. Condition good.
95	31.5	Trace			Bored well 10", depth not known. Board top in poor condition. Well 5' from house. Land slopes away from well to privy. Privy 90'. Condition not very clean.

FIELD TESTS OF WELLS—Continued.

Serial No. of Sample	Chlorides Parts per Million	Nitrites Parts per Million	Pollution indicated by permanganate test	Physical and microscopical tests	Name of owner and history of well
96	1.45	None			Bored well 35' deep, 3 years old. Board top in fair condition. Privy 100'. One tile 5' from well. Other tile 30' from well. Surface draining away from well. Fair surroundings. Two typhoid cases present.
97	70.0	.00005			Dug well 35' deep. Board top fairly tight. Privy 100'. House 20'. Land level. Conditions rather dirty.
98	16.0	.00015			Bored well 35' deep. Board top in poor condition. Privy 60'. Alley 10'. Sanitary condition fair. 5' from house.
99	15.5	None			Dug well 32' deep. Board top only in fair condition. 125' to privy. Drain to street from well. Condition fair. Well 5' from house.

(d) SANITARY ANALYSES OF WATER FROM BARNES CITY, IOWA.

BY C. N. KINNEY, CHEMIST OF THE IOWA STATE BOARD OF HEALTH.

Thirteen samples of preceding list. Samples received May 28, 1914.

Determinations	List No. 95	List No. 96	List No. 11	List No. 4	State Standarls for Shallow Wells Parts Per Million
Turbidity	Hazy	None	None	None	
Sediment	Some	None	None	None	
Nitrogen as Free Ammonia	.0035	.0010	.0200	None	.0250
Nitrogen as Nitrites	Trace	None	.02500	Trace	.00010
Nitrogen as Alb. Ammonia	None	.0005	.0165	None	.1750
Nitrogen as Nitrates	.9090	.5450	6.0000	8.0000	.7500
Chlorides	31.25	1.45	13.00	34.00	3.50
Phosphates	.25	.15	.25	.10	1.75
Residue on Evaporation	506.00	377.00	433.00	592.00	350.00
Volatile Solids	214.00	163.00	181.00	240.00	
Fixed Solids	292.00	214.00	252.00	352.00	
Color and Odor on Ignition	Slight	Slight	Slight	Very slight	
Microscopical	Cons. br. iron filled algae. Numerous small animal forms.	Few algae	Cons. colorless algae. Numerous small animal forms	Few algae	
					2.50 Fe. (Ferrous)
					150.00 (Total hardness)

Determinations	List No. 98	List No. 10	List No. 6	List No. 97	State Standards for Shallow Wells Parts per Million
Turbidity	Slight	None		None	
Sediment	Some	None		None	
Nitrogen as Free Ammonia	.0005	.0008	None	Trace	.0250
Nitrogen as Nitrites	.00015	.00025	None	.00005	.00010
Nitrogen as Alb. Ammonia	.0550	.0150	.0015	.0450	.1750
Nitrogen as Nitrates	16.1000	3.5500	6.4000	17.0000	.7500
Chlorides	160.00	3.00	9.25	70.00	3.50
Phosphates	.40	.35	.25	.15	1.75
Residue on Evaporation	1865.00	363.00	367.00	1230.00	350.00
Volatile Solids	815.00	154.00	155.00	620.00	
Fixed Solids	1050.00	209.00	212.00	610.00	
Color and Odor on Ignition	Slight color	Slight	Very little	Slight	
Microscopical	Numerous br. iron filled algae. Large and small animal forms	Consid. br. algae. Some large animal forms	Consid. small algae, colorless and br. Some small animal forms	Few small animal forms. Few small br. algae	
					2.50 Fe. (Ferrous)
					150.00 (Total hardness)

Determinations	List No. 8	List No. 5	List No. 3	List No. 99	State Standards for Shallow Wells Parts per Million
Turbidity	None	None	None	None	
Sediment	None	None	None	None	
Nitrogen as Free Ammonia	.0035	.0015	.0015	.0015	.0250
Nitrogen as Nitrites	.00015	.00025	.00020	None	.00010
Nitrogen as Alb. Ammonia	.1450	.0150	.0500	.0150	.1750
Nitrogen as Nitrates	21.3300	18.8200	6.4000	9.1500	.7500
Chlorides	25.15	85.00	6.00	12.50	3.50
Phosphates	.10	.25	.35	.15	1.75
Residue on Evaporation	779.00	1002.00	454.00	459.00	350.00
Volatile Solids	510.00	516.00	161.00	221.00	
Fixed Solids	269.00	486.00	293.00	238.00	
Color and Odor on Ignition	Some	Slight	Slight	Some	
Microscopical	Consid. br. iron filled algae. Some large animal forms.	Consid. br. and colorless algae. Some small animal forms.	Consid. br. and colorless algae. Some small animal forms.	Consid. br. and colorless algae. Large animal forms.	
					2.50 Fe. (Ferrous)
					150.00 (Total hardness)

Abbreviations: af—animal forms; a—algae; c—colorless; b—brown; g—green; Fe—iron; sm—small; cons—considerable; sl—slightly.

SANITARY ANALYSIS OF WATER—Continued.

Determinations	List No. 7	State Standards for Shallow Wells Parts Per Million
Turbidity	None	.0250
Sediment	None	.00010
Nitrogen as Free Ammonia	.0010	.1750
Nitrogen as Nitrites	.00050	.7500
Nitrogen as Alb. Ammonia	.0008	3.50
Nitrogen as Nitrates	7.2700	1.75
Chlorides	32.50	350.00
Phosphates	.25	
Residue on Evaporation	762.00	
Volatile Solids	303.00	
Fixed Solids	459.00	
Color and Odor on Ignition	Slight	2.50 Fe. (Ferrous)
Microscopical	Consid. colorless algae. Some large animal forms	150.00 (Total hardness)

(e)

CONCLUSIONS.

1. The general unsanitary condition of Barnes City for many years past and the improper care of previous typhoid patients have perpetuated typhoid in this town for several years.

2. The analyses of the water of the wells of Barnes City show that these wells, particularly the wells in the older part of the town, have been receiving, and are now receiving, surface contamination. This contamination being partly the seepage or drainage from outdoor closets and cess pools and partly the contamination furnished by surface pollution of the ground when surface materials are dissolved by the rainwater falling upon the surface of the ground and then percolating through the soil and supplying the shallow wells with water. This condition of the wells has made it possible for the contamination of the wells by polluting matter containing typhoid bacilli at almost any time for several years past.

A study of the analyses made by the chemists and assistant bacteriologist of the state board of health warrants the following classification of these wells:

Good. The following numbered wells, sixteen in number: Nos. 14, 18, 24, 25, 30, 42, 52, 53, 56, 76, 77, 90, 91, 92, 94, 96.

Bad. The following numbered wells, fifty-three in number: Nos. 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15, 16, 17, 19, 20, 21, 22, 31, 35, 37, 38, 39, 40, 44, 48, 49, 50, 51, 57, 58, 59, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 74, 79, 80, 81, 82, 85, 93, 95, 97, 98.

Suspicious. The following numbered wells, twenty-eight in number: Nos. 10, 23, 26, 27, 28, 29, 32, 33, 34, 41, 43, 45, 46, 47, 54, 55, 60, 65, 73, 75, 78, 83, 84, 86, 87, 88, 89, 99.

A careful study of the analysis, chemical, microscopical and bacteriological, as well as a study of the conditions surrounding these wells, will reveal reasons for classifying these wells as suspicious. In a few cases, surface conditions alone require this classification; in other cases, a high chlorine content compels this classification; in other cases, where the chlorine content is low, the nitrite showing is high, compelling this classification; in other cases, cess pool or privy contamination is indicated, though the contamination is slight, and this renders such wells suspicious; and in still other cases, where the chlorine and nitrite contents are low, there is still indicated considerable pollution by the permanganate test, the microscopical examination and the history of the well, which classifies these wells as suspicious. About one-third of these wells classified as suspicious might be maintained for some years as good wells with proper sanitary precautions.

3. Beyond reasonable doubt, the recent typhoid in Barnes City started from the use of polluted water from well No. 95, the first case of typhoid fever, dated December 1, 1913, being undoubtedly caused by the water of this well, the history of which is previously given in this report. It is quite possible that the second case of typhoid fever, dated December 26th, was also water-borne. The next well pronounced case, dated April 6, 1914, without doubt, was caused by using the water of well No. 8, which both chemical and bacteriological analyses show to be seriously con-

taminated, and from the sources of this contamination the water of this well could, and would, transmit typhoid bacilli to the users of such water.

4. The epidemiological investigation reveals the fact that a considerable proportion of the typhoid cases are, without doubt, contact cases. It is generally true that the typhoid, once started, is perpetuated by various methods of contact infection. As shown in the report of Mr. Alden, there is no conclusive evidence of milk-borne typhoid, but the evidence appears to eliminate the milk as a means of distribution of the typhoid in this epidemic.

5. We must, therefore, conclude that the typhoid epidemic at Barnes City, Iowa, was caused primarily by direct well infection, and that the disease was spread from these water-borne cases and perpetuated by different means of contact.

The above conclusions are concurred in by the sanitary engineer of the state board of health, Lafayette Higgins, and the assistant bacteriologist of the state board of health, A. M. Alden.

RECOMMENDATIONS.

It is recommended, *first*, that the town of Barnes City be directed to take the necessary steps to install a public water supply, a sewer system with sewage disposal plant, and a system of garbage disposal, at the earliest date possible.

It is recommended that the state board of health, through its representative, shall meet with the local board of health, or town council, of Barnes City, in consultation regarding methods and means of making these installations.

It is recommended, *second*, that the following steps be taken in the control and abatement of the present epidemic:

1. That all possible care shall be taken to properly dispose of the excreta from typhoid patients.

2. That every resident of the town, with the exception of those who have recovered from the typhoid fever and still retain immunity against the disease, should receive the anti-typhoid vaccine treatment.

3. That garbage and litter of all kinds shall be immediately collected, removed from the town and destroyed, and that continual care be exercised to prevent the accumulation of garbage in any considerable quantity in the streets or alleys of the town, or upon the premises of the property owners and residents.

4. That all privy vaults shall be cleaned and disinfected by the use of fresh quick-lime, and that the contents of all such privy vaults shall be removed beyond the territory in which such matter may pollute the water supply of the wells and shall be placed in trenches dug for the purpose, covered with sufficient quick-lime to insure perfect sterilization and decomposition, and then covered with earth to a depth of two feet or more; and there shall be also included in this disposal the contents of any abandoned vaults or pits, which may have been so abandoned and covered with earth on the premises of the residents of the town recently, or within the past year, for the reason that such contents will remain for a long period of time as a source of pollution of ground water unless

so removed. It is further recommended that the cleaning of the privy vaults be required at least twice a year, and oftener if necessary, until the sewer system is installed and the outside toilets abated; and it is also recommended that all privy vaults in use to be sterilized by the use of quick-lime or other chemical means whenever deemed necessary by the health officer and the local board of health acting under the advice of the state board of health.

5. That the outside toilet situated at the rear of the store building located on block 10, which has been designated as the probable source of the typhoid infection, be condemned by the local board of health and closed unless such toilet is provided with an absolutely water-tight cement vault and the contents disinfected and sterilized frequently, and the contents removed at stated intervals, to be determined by its use.

6. That additional care be taken in the maintenance of all privy vaults so situated that in times of rainfall, or when the ground water is moving rapidly, such vaults may pollute the water supply of wells; that such vaults shall have water-tight basins, and that such other precautions as may be deemed necessary by the state board of health shall be taken.

7. That additional sanitary precautions shall be taken to maintain the wells that have been found *good* in a satisfactory condition; that necessary steps shall be taken to protect and improve the wells that have been found *suspicious*, this procedure to be defined by the sanitary engineer of the state board of health, in co-operation with the local board of health; that all the wells that have been found *bad* shall be condemned by the local board of health, and their use forbidden, except as hereafter provided.

8. That the local board of health shall require the users of water from *suspicious* or *bad* wells to sterilize such water, either by boiling or by chemical treatment; and, if such orders are not obeyed, the wells found *bad* shall be closed and no further use made of the same; and it is further recommended that certain of the wells found *bad*, which are so situated that they continually receive serious contamination from underflow water, shall be permanently closed and their use forbidden, the wells last mentioned to be designated in conference between the engineer of the state board of health and the local board of health.

9. That such other recommendations as may appear necessary after a conference between the representatives of the state board of health and the local board of health shall be carried out by the municipal authorities of Barnes City.

The above recommendations are made and agreed to by the sanitary engineer of the state board of health, Lafayette Higgins, and the assistant director and bacteriologist of the state board of health, A. M. Alden.

In concluding this report of the epidemic of typhoid fever at Barnes City, Iowa, I desire to say that the investigations of Mr. Alden and myself, as well as the analyses made by Mr. Jordan and Professor Kinney indicate that the state board of health should exercise all of its powers to correct the conditions existing in Barnes City, and which have been

responsible for the serious epidemic of typhoid fever in that town, which resulted in the serious illness of so many people and in the death of one young man.

It seems especially necessary, in this instance, that the state board of health shall exercise all of the advisory and directory powers contemplated in section 2565 of the code, and in section 2564, supplement to the code, 1913, relating to sanitary investigations and rules and regulations necessary for the preservation of the public health.

I therefore recommend that the state board of health, as a body, or through its authorized representatives, shall meet with, and direct, the local board of health of Barnes City, Iowa, to carry out the necessary provisions and precautions to abate the present epidemic and to prevent a recurrence of epidemics in the future.

Respectfully submitted,

(Signed) LAFAYETTE HIGGINS.

OFFICE WORK.

(a)

APPROVAL OF PLANS AND SPECIFICATIONS.

Centerville, Appanoose County.—Population 6,936. Plans and specifications for water filtration plant prepared by The Pittsburg Filter Manufacturing company, F. B. Leopold, general manager. Plans show horizontal pressure filter, extended type, housed in the customary manner. The filter company entered into a contract guaranteeing the filtration of 480,000 gallons per day (twenty-four hours), with a bacterial reduction of an average of not less than 97 per cent when the raw water contains an average of not less than 3,000 per cc. or more, and shall contain an average not exceeding 100 per cc. when the raw water contains an average of less than 3,300 per cc. The filter company also guarantees that the amount of water used for washing filters shall not exceed an average of 5 per cent of the total amount of water filtered. The method of filtration includes the use of aluminium sulphate and hypochlorite solutions. The water supply is furnished by an impounding reservoir. Plans and specifications approved July 7, 1913.

Mt. Pleasant, Henry County.—Population 3,874. Plans and specifications for reinforced concrete reservoir for installing water works system, prepared by Burns and McDonnell, consulting engineers, Kansas City, Mo. Plans and specifications approved January 30, 1914.

Mt. Ayr, Ringgold County.—Population 1,646. Plans and specifications for a system of water works, prepared by E. T. Archer & Company, Kansas City, Mo. Plans show water supply from the sources made up of shallow wells, supplemented by an impounding reservoir, the supply of the wells being drawn from the water bearing gravel bed lying below the bed of the impounding reservoir. The system consists of an elevated steel tank, capacity 50,000 gallons, pumping station, and the customary distributing pipe system. Plans and specifications approved February, 1914.

Low Moor, Clinton County.—Population 235. Preliminary report of water works system, made by Charles P. Chase, consulting engineer, chief engineer and manager, Iowa Engineering Company, Clinton, Iowa, is accompanied by a map of the town showing distributing system. The report recommends the installation of a 40,000 gallon steel tank on a steel tower. Preliminary report approved February 1, 1914.

Stratford, Hamilton County.—Population 554. Plans and specifications for sewer system prepared by K. C. Gaynor, consulting engineer, Sioux City, Iowa. Plans show the entire town included in one sewer district. The sewer system is provided with sewage treatment plant consisting of septic tank with intermittent sand filters. Plans and specifications approved February 6, 1914.

Osceola, Clarke County.—Population 2,416. Preliminary report and plans and specifications for system of water works prepared by Charles P. Chase. Plans include new pumping station and storage reservoir. Plans and specifications approved February 15, 1914.

Chelsea, Tama County.—Population 507. Plans and specifications for water works prepared by E. E. Harper, consulting engineer, Kansas City, Mo. System consists of an elevated steel tank, 40,000 gallons capacity, pumping station and the customary distributing pipe system. The water supply comes from shallow wells sunk into water bearing gravel beds lying in the valley of the Iowa river. The wells are situated southwest of the town. The location of the water supply was visited and approved by the engineer of the board. Plans and specifications were approved February 16, 1914.

Mitchellville, Polk County.—Population 869. Plans and specifications for system of water works, prepared by E. T. Archer & Company, show water supply from deep well located in the east part of town. System consists of elevated steel tank, pumping station and the customary distributing pipe system. Plans and specifications approved March 2, 1914.

Lamoni, Decatur County.—Population 1,541. Plans and specifications for sewer system prepared by Bruce & Standeven, consulting engineers, Omaha, Neb., show the entire town included in one sewer district. Sewer system is equipped with sewage treatment plant consisting of an Imhoff tank and contact filters. Plans and specifications approved March 4, 1914.

Alexander, Franklin County.—Population 262. Plans and specifications for system of water works prepared by the Des Moines Bridge and Iron Company. Plans include elevated steel tank of 30,000 gallons capacity, pumping station and the customary distributing pipe system. Plans and specifications approved April 15, 1914.

Davis City, Decatur County.—Population 489. Plans and specifications for system of water works prepared by C. W. Roland Company, engineers, Des Moines, Iowa. The system consists of an elevated steel tank, capacity 30,000 gallons, pumping station, and the customary distributing pipe system. The water supply contemplated was to be taken from shallow wells in an unsanitary part of the town. The engineer of the board visited Davis City and condemned the proposed location for the well. The system was constructed, but at the present date, June 30, 1914, no

satisfactory water supply has been determined upon. Plans and specifications approved April 16, 1914.

Sheffield, Franklin County.—Population 824. Plans and specifications for sewer system, prepared by Harper & Stiles, consulting engineers, Kansas City, Mo., show entire town included in one sewer district. Plans show sewer system consisting of septic tank and intermittent sand filters. Plans and specifications approved April 16, 1914.

Slater, Story County.—Population 473. Plans and specifications for system of water works prepared by C. W. Roland Company, show water supply from deep well, favorably located within the town. The system consists of an elevated steel tank, capacity 30,000 gallons, a pumping station, and the customary distributing pipe system. Plans and specifications approved April 20, 1914.

Valley Junction, Polk County.—Population 2,573. Plans and specifications for water works prepared by the Iowa Engineering Company, show water supply from shallow well situated in Raccoon valley west of city of Valley Junction. The system consists of an elevated steel tank, capacity 70,000 gallons, pumping station and the customary distributing pipe system. The location of the wells to be used as public water supply was visited by the engineer of the board and the location approved May, 1914. Plans and specifications approved May, 1914.

Chariton, Lucas County.—Population 3,794. Preliminary report on a proposed sewer system prepared by Charles P. Chase is accompanied by a topographical map of the city of Chariton showing the city to be divided into four drainage districts. Preliminary report approved February 28, 1914. Complete plans for the sewer system at Chariton were approved May 4, 1914. Plans show four sewer districts. Three of the sewer systems are to be equipped with treatment plants consisting of Imhoff tanks and intermittent sand filters, and one to be equipped with treatment plant consisting of septic tank and intermittent sand filters.

Clarion, Wright County.—Population 2,065. Plans and specifications for sewer system prepared by C. H. Currie, civil and sanitary engineer, Webster City, Iowa. The plans show that the entire city of Clarion is included in one sewer district. The sewer system is provided with treatment plant consisting of an Imhoff tank with intermittent sand filters. The situation requires that the sewage be pumped from the receiving chamber into the disposal plant. Plans and specifications approved May 4, 1914.

Centerville, Appanoose County.—Population 6,936. Plans and specifications for sand filters additional to the present sewage treatment plant prepared by M. G. Hall, civil engineer, Centerville, Iowa. Plans and specifications approved May 27, 1914.

Winfield, Henry County.—Population 934. Plans and specifications for system of water works prepared by the Des Moines Bridge and Iron Company. Plans provide for the construction of an elevated steel tank, capacity 50,000 gallons, and a pumping station. These improvements are additional to the existing water works system. Two deep wells sunk in the public park furnish the water supply. Plans approved June 22, 1914.

Keota, Keokuk County.—Population 988. Preliminary report on a proposed sewer system made by Charles P. Chase. The report is accompanied by a topographical map of the city of Keota, showing the entire city as one sewer district. Preliminary report approved June 23, 1914.

Elma, Howard County.—Population 807. Plans and specifications for system of water works prepared by the Des Moines Bridge and Iron Company. Plans include elevated steel tank, capacity 50,000 gallons, pumping station and the customary distributing pipe system. Plans approved June 26, 1914.

Guthrie Center, Guthrie County.—Population 1,337. Plans and specifications for sewer system prepared by the Iowa Engineering Company, and the construction supervised by Bruce & Standeven. Plans show the entire town included in one sewer district. Sewer system equipped with sewage treatment plant consisting of septic tank and intermittent sand filters. Plans approved June 27, 1914.

OFFICE WORK.

(b)

The letters that passed between the engineer of the State Board of Health and the officials or residents of the cities and towns listed below were not ordinary communications. In many cases several letters passed before the necessary information was understood. In any case, the letters written were lengthy, explanatory and involved technical discussion. It is fair to assume also that the information given in this manner was not limited to the parties receiving the correspondence. Frequently, an inquiry from one party would give information to several neighbors or to the residents of an entire town.

NAME OF TOWN.	SUBJECT OF INQUIRY.
Ackley	Life of cast iron water pipe.
Alton	Treatment of city water.
Ames (State College)	Use of chemical closets.
Ashton	Cellar drain into sanitary sewer.
Boone	Building ventilation, rendering plant nuisance.
Braddyville	Sewage disposal.
Burlington	Water supply.
Burt	Septic tanks.
Calumet	Discussion of contaminated wells.
Cedar Rapids	Petition to abate nuisance.
Centerville	Water filtration plant.
Chariton	Sewer system.
Cincinnati	Disposal of night soil.
Clarion	Sewer system.
Cresco	Investigation of water supply.
Dysart	Use of lead water pipes.
Eagle Grove	Unsanitary condition of sewer.
Edgewood	Pollution from septic tank.
Eldora	Laying water and sewer pipe.
Emmetsburg	Sanitary sewer in incorporated town.

NAME OF TOWN.	SUBJECT OF INQUIRY.
Epworth	Rule for construction of septic tank.
Everly	Disposal of garbage. Septic tank.
Ft. Madison	Contaminated water supply.
George	Chemical closets, cess pools.
Gilmore City	Disposal of sewage. Septic tanks.
Hampton	Cemetery drainage.
Independence	Septic tanks. Bacteria.
Jefferson	Sewage disposal.
Lamoni	Sewer and sewage disposal.
Laurel	Unsanitary condition in town.
Ledyard	New public well.
Lost Nation	Information on Russell Sewer System.
Manning	Use of lead water pipes.
Marcus	Water supply. Sewage disposal.
Mechanicsville	Typhoid fever, polluted wells.
Missouri Valley	Dead ends in water pipes.
Monona	Sewer system.
Moulton	Cess pools. Tile drains.
Mystic	Hotel sewage disposal.
Mt. Pleasant	Water works reservoir. Open sewer .
Mt. Vernon	Garbage disposal.
Onawa	Sewage disposal.
Osage	Sewage disposal.
Ossian	Septic tank plans and specifications.
Perry	Garbage disposal.
Peterson	Sewer system.
Protivin	Sewage disposal. Water supply.
Ringgold	Sewer system.
Rockford	Septic tanks.
Sac City	Cement sewer pipe.
Scandia	Water supply, sanitary condition.
Schaller	Drainage of cemetery.
Seymour	Open drains and sewers.
Shelby	Septic tanks.
Sioux Rapids	Open sewer.
Spencer	Water sterilization.
Story City	Use of lead water pipes.
Stuart	Common drain tile, septic tank.
Swea City	Septic tank.
Thompson	Septic tank.
Traer	Sewage disposal.
Van Meter	Sewage disposal.
Webster City	Sewage disposal. Common drainage.

Total—138 letters.

In addition to the correspondence above listed the engineer has responded to the calls of different Engineers who have been engaged in designing sewer systems and sewage treatment plants throughout the state. In many cases this correspondence has been very extensive, and has involved the discussion of the process of sewage purification and the proper design of septic tanks and intermittent sand filters.

This correspondence shows a desire on the part of designing engineers to co-operate fully with the state board of health in solving the problem of successful sewage treatment. Such co-operation will result in uniform practice in designing sewage treatment plants, and will also enable the designing engineers to take advantage of the results of recent investigations that have been made for the purpose of determining the effect of sewage treatment.

OFFICE WORK.

(c)

The advice and consultation relative to the installation of water works, sewers, sewage treatment and garbage disposal by the engineer to various parties visiting the office of the state board of health for the purpose of obtaining such advice and consultation, constitute a considerable part of the work done by the engineer.

No account of time has been carefully made, but perhaps one-fifth of the time spent by the engineer in office work has been devoted to this service.

This work is rapidly growing and it would not be long until the services of an engineer on full time might be required to satisfactorily dispose of the demands that will be made.

In field service the engineer has responded to many calls that have been made throughout the State. Some of the trips have been to the remote parts of the State, wherein much time has been consumed in traveling to and from such locations. Aside from the necessity of visiting locations in order to properly dispose of the local problems, a much more economical service can be rendered by the engineer in meeting the officials of such locality at the office of the board of health. It has happened that a conference not exceeding one hour of time has accomplished as much for a municipality as the engineer was able to accomplish by making a visit to such locality. Evidently this type of service should be encouraged from an economic point of view.

In addition to this it has frequently happened during the past year that consulting and designing engineers, resident within the State, and in a number of cases resident in adjoining states, have visited the office and held extended conferences relative to the best practices to be recommended for the designing and installation of water works, sewers, sewage treatment plants, and garbage disposal plants.

NOTE.—The following list of cities, towns and villages, including a map, is appended for the purpose of answering a large number of inquiries relative to the information therein contained. A comprehensive map exhibiting the distribution of sanitary installations throughout the State has been compiled from such information as could be gathered from all available sources.

The information contained in the list and shown upon the map should be of great value, in a comparative way to engineers, health officers and municipalities.

LIST OF CITIES, TOWNS AND VILLAGES IN IOWA.

Compiled from Census of 1910 and from Rand & McNally's Pocket Map and Shippers' Guide. Where no population is shown such towns were probably included in Township Census. Many of the towns and villages not incorporated are accredited with a stated population in the list, as given. A few of the towns or villages listed are Railway Crossings with little or no population. An absolutely correct list is not available, but the list as given is believed to be practically correct.

Names of Incorporated Cities and Towns, as reported in the 1914 report of the Auditor of State, Department of Finance and Municipal Accounts, are shown in italics.

This list is compiled to show the extent and progress of installation of Water Works, Sewers and Sewage Disposal, and is compiled from information gathered by M. I. Evinger of the Iowa State College, and Lafayette Higgins of the Iowa State Board of Health.

***Note:—Water Works indicated thus *
Water Works and Sewers indicated thus **
Water Works, Sewers and Sewage Disposal indicated thus ***

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Abbott	106	Hardin	....
Abbott Crossing	.....	Hardin	....
Abingdon	200	Jefferson	....
Ackley	1,244	Hardin	***
Ackworth	119	Warren	....
Acme	30	Howard	....
Adair	900	Adair	*
Adams	.....	Muscatine	....
Adaville	18	Plymouth	....
Adaza	100	Greene	....
Addison	.....	Humboldt	....
Adel	1,289	Dallas	**
Adelphi	61	Polk	....
Aetna	.....	Wayne	....
Afton	1,014	Union	*
Afton Junction	.....	Union	....
Agency	322	Wapello	....
Ainsworth	408	Washington	*
Akron	1,130	Plymouth	**
Aladdin	.....	Black Hawk	....
Albaton	23	Monona	....
Albert City	261	Buena Vista	....
Albia	4,969	Monroe	***
Albion	457	Marshall	....
Alburnett	250	Linn	....
Alden	699	Hardin	**
Alexander	262	Franklin	*
Algona	2,908	Kossuth	**
Alice	35	Linn	....
Alleman	50	Polk	....
Allen	.....	Harrison	....
Allendorf	35	Osceola	....
Allensgrove	.....	Scott	....
Allerton	862	Wayne	....
Allison	495	Butler	*
Almont	50	Clinton	....
Almoral	50	Delaware	....
Almoral Station	.....	Delaware	....
Alpha	100	Fayette	....
Alta	959	Buena Vista	*
Alta Vista	356	Chickasaw	*
Alton	1,046	Sioux	*
Altoona	438	Polk	....
Alvord	283	Lyon	*
Amador	10	Wapello	....
Amana	621	Iowa	....
Amber	100	Jones	....
Amboy	.....	Jasper	....
Ambrose	12	Iowa	....
Ames	4,223	Story	***
Amish	75	Johnson	....
Amity	.....	Scott	....
Amund	15	Winnebago	....
Anamosa	2,983	Jones	**
Anderson	75	Fremont	....
Andersons	.....	Linn	....
Andover	51	Clinton	....
Andrew	307	Jackson	....
Angus	248	Boone	....
Anita	1,118	Cass	*
Ankeny	445	Polk	....
Annieville	.....	Clay	....
Anthon	635	Woodbury	*
Aplington	448	Butler	....
Arbor Hill	66	Adair	....
Arcadia	390	Carroll	....
Archer	351	O'Brien	....
Ardon	40	Muscatine	....
Aredale	100	Butler	....
Argo	35	Scott	....
Argyle	60	Lee	....
Arion	168	Crawford	*
Arispe	155	Union	....
Arlington	678	Fayette	*
Armah	.....	Iowa	....
Armour	.....	Pottawattamie	....
Armstrong	586	Emmet	*
Arnold	200	Humboldt	....
Arnold's Park	273	Dickinson	....
Artesian	.....	Bremer	....
Arthur	215	Ida	*
Asbury	75	Dubuque	....
Ascot	.....	Pottawattamie	....
Ashawa	.....	Polk	....
Ashgrove	54	Davis	....
Ashton	518	Osceola	***
Aspinhall	200	Crawford	....
Astor	42	Crawford	....
Atalissa	220	Muscatine	....
Athelstan	148	Taylor	....
Atkins	250	Benton	....
Atlantic	4,560	Cass	**
Attica	150	Marion	....
Atwood	.....	Keokuk	....
Auburn	399	Sac	....
Audubon	1,928	Audubon	*
Augusta	100	Des Moines	....
Aurelia	625	Cherokee	*
Aurora	287	Buchanan	....
Austin	.....	Sioux	....
Austinville	65	Butler	....
Avenarius	97	Dubuque	....
Avery	450	Monroe	....
Avoca	1,520	Pottawattamie	**
Avon	15	Polk	....
Ayrshire	337	Palo Alto	*
Babcock	.....	Bremer	....
Badger	212	Webster	....
Bagley	488	Guthrie	*
Bailey	226	Mitchell	....
Baird	.....	Harrison	....
Baker	.....	Jefferson	....
Baldwin	229	Jackson	*
Balfour	.....	Mills	....
Ballinger	.....	Lee	....
Balltown	100	Dubuque	....
Ballyclough	41	Dubuque	....
Bancroft	830	Kossuth	*
Bangor	35	Marshall	....
Bankston	50	Dubuque	....
Bard	.....	Louisa	....
Barnes City	307	Mahaska	....
Barney	70	Madison	....
Barnum	154	Webster	....
Barryville	.....	Delaware	....

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Bartlett	100	Fremont	....
Bassett	130	Chickasaw	....
Batavia	560	Jefferson	....
Battle Creek	527	Ida	**
Bauer	18	Marion	....
Baum	.....	Cherokee	....
Baxter	527	Jasper	....
Bayard	539	Guthrie	*
Bayfield	100	Muscatine	....
Beach	.....	Dickinson	....
Beacon	623	Mahaska	....
Beaconsfield	148	Ringgold	....
Beals	.....	Calhoun	....
Beaman	220	Grundy	....
Bear Creek	75	Wapello	....
Bear Grove	80	Guthrie	....
Beaver	150	Boone	....
Beck	.....	Lee	....
Beckwith	46	Jefferson	....
Bedford	1,883	Taylor	**
Beebeetown	.....	Harrison	....
Beery	.....	Henry	....
Belfast	90	Lee	....
Belinda	25	Lucas	....
Belknap	110	Davis	....
Bellair	50	Appanoose	....
Belle Plaine	3,121	Benton	**
Bellevue	1,776	Jackson	*
Belmond	1,224	Wright	***
Beloit	50	Lyon	....
Benan	.....	Carroll	....
Bennett	243	Cedar	....
Bennetville	.....	Dubuque	....
Benson	35	Black Hawk	....
Bentley	200	Pottawattamie	....
Benton	191	Ringgold	....
Bentonsport	141	Van Buren	....
Bentonsville	.....	Wayne	....
Berea	50	Adair	....
Berkley	100	Boone	....
Berlin	200	Tama	....
Bernard	95	Dubuque	....
Berne	.....	Crawford	....
Bernhardt	75	Jefferson	....
Bernina	.....	Mahaska	....
Bertram	100	Linn	....
Berwick	75	Polk	....
Bethel	.....	Washington	....
Bethleham	75	Wayne	....
Bethseda	25	Page	....
Bettendorf	909	Scott	**
Beulah	.....	Clayton	....
Beverley	.....	Linn	....
Bevington	200	Madison	....
Biddick	.....	Montgomery	....
Bidwell	10	Wapello	....
Big Mound	.....	Lee	....
Big Rock	100	Scott	....
Big Spring	.....	Wayne	....
Bingham	75	Page	....
Birmingham	572	Van Buren	....
Black Hawk	.....	Black Hawk	....
Black Hawk	.....	Davis	....
Black Hawk	....	Scott	....
Bladensburg	35	Wapello	....
Blaine	.....	Buena Vista	....
Blairsburg	241	Hamilton	....
Blairstown	532	Benton	....
Blakesburg	344	Wapello	....
Blakeville	.....	Black Hawk	....
Blanchard	408	Page	*
Blanden	.....	Pocahontas	....
Blencoe	283	Monona	....
Blessing	.....	Black Hawk	....
Bliedorn	.....	Clinton	....
Blockly	25	Decatur	....
Blockton	648	Taylor	*
Bloomfield	2,028	Davis	***
Blue Grass	223	Scott	....
Bluffs	.....	Woodbury	....
Bluffton	75	Winneshiek	....
Blyth	75	Mahaska	....
Bode	419	Humboldt	*
Boles	20	Black Hawk	....
Bolan	50	Worth	....
Bolton	200	Mahaska	....
Bonair	56	Howard	....
Bonaparte	597	Van Buren	*
Bondurant	287	Polk	....
Boomer	5	Pottawattamie	....
Boone	10,347	Boone	**
Booneville	143	Dallas	....
Border Plains	.....	Webster	....
Botna	75	Shelby	....
Bouton	150	Dallas	....
Bowen	.....	Jones	....
Boxelder	.....	Mills	....
Boxholm	150	Boone	....
Boyd	.....	Black Hawk	....
Boyd	55	Chickasaw	....
Boyden	364	Sioux	....
Boyer	75	Crawford	....
Bracewell	12	Decatur	....
Bradyville	283	Page	....
Bradford	100	Franklin	....
Bradgate	175	Humboldt	....
Brainard	27	Fayette	....
Brandon	200	Buchanan	....
Brayton	137	Audubon	....
Brazil	500	Appanoose	....
Breda	374	Carroll	*
Bremer	40	Bremer	....
Bricker	.....	Lee	....
Bridgeport	.....	Wayne	....
Bridgewater	365	Adair	....
Brighton	776	Washington	....
Briscoe	.....	Adams	....
Bristol	.....	Worth	....
Bristow	291	Butler	....
Britt	1,303	Hancock	*
Broadway	.....	Delaware	....
Broadway	.....	Black Hawk	....
Brogan	.....	Crawford	....
Bromley	140	Marshall	....
Brompton	.....	Monroe	....
Bronson	250	Woodbury	....
Brooklyn	1,233	Poweshiek	*
Brooks	175	Adams	....
Brookville	.....	Jefferson	....
Brough	39	Dallas	....
Brown	76	Clinton	....
Brown	.....	Johnson	....
Brown's Lake	.....	Jackson	....
Brownville	90	Mitchell	....
Bruce	25	Wright	....
Brughier Bridge	.....	Woodbury	....
Brunsville	.....	Plymouth	....
Brushby	100	Webster	....
Bryant	150	Clinton	....
Bryantburg	50	Buchanan	....
Buchanan	61	Cedar	....
Buck Creek	25	Bremer	....
Buckeye	140	Hardin	....
Buck Grove	87	Crawford	....
Buckingham	75	Tama	....
Budd	.....	Dubuque	....
Buena Vista	.....	Clayton	....
Buena Vista	35	Clinton	....
Buffalo	456	Scott	....
Buffalo Center	753	Winnebago	*
Bullard	.....	Lee	....
Bunch	100	Davis	....
Burch	.....	Polk	....
Burchinal	85	Cerro Gordo	....
Burdett	48	Franklin	....
Burlington	24,324	Des Moines	**
Burnside	100	Webster	....
Burrell	50	Decatur	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Burr Oak	600	Winneshiek	....
Burt	495	Kossuth	*
Bussey	669	Marion	....
Butler	25	Keokuk	....
Butler Center	.....	Butler	....
Butlerville	.....	Tama	....
Buxton	4,500	Monroe	....
Cairo	100	Louisa	....
Calamus	270	Clinton	....
Caldwells	.....	Dallas	....
Caledonia	35	Ringgold	....
Calhoun	.....	Harrison	....
California	75	Harrison	....
Callender	321	Webster	....
Calliope	75	Sioux	....
Calmar	849	Winneshiek	***
Caloma	29	Marion	....
Calumet	242	O'Brien	....
Camanche	629	Clinton	....
Cambria	200	Wayne	....
Cambridge	696	Story	*
Cameron	.....	Cerro Gordo	....
Cameron	.....	Dubuque	....
Campbell	35	Polk	....
Campton	.....	Delaware	....
Campus or College	.....	Story	***
Canby	25	Adair	....
Canoe	15	Winneshiek	....
Canton	163	Jackson	....
Cantril	445	Van Buren	....
Capron	.....	Marshall	....
Carbon	246	Adams	....
Carbon	.....	Davis	....
Carbon	.....	Webster	....
Carbondale	76	Polk	....
Cardiff	.....	Mitchell	....
Carl	50	Adams	....
Carlisle	592	Warren	....
Carlson	.....	Scott	....
Carmel	25	Sioux	....
Carnavron	150	Sac	....
Carnes	35	Sioux	....
Carney	.....	Floyd	....
Carney	100	Polk	....
Carnforth	40	Poweshiek	....
Carpenter	121	Mitchell	....
Carroll	3,546	Carroll	***
Carrollton	100	Carroll	....
Carrville	49	Floyd	....
Carson	640	Pottawattamie	*
Cartersville	200	Cerro Gordo	....
Cascade	.....	Des Moines	....
Cascade	1,268	Dubuque	*
Casey	735	Guthrie	*
Cass	.....	Jones	....
Cass Junction	.....	Black Hawk	....
Castalia	230	Winneshiek	....
Castana	364	Monona	*
Castle Grove	35	Jones	....
Castleville	.....	Buchanan	....
Cattese	.....	Dubuque	....
Cedar	50	Mahaska	....
Cedar Bluff	116	Cedar	....
Cedar Falls	5,012	Black Hawk	**
Cedar Heights	.....	Black Hawk	....
Cedar Rapids	32,811	Linn	**
Cedar Valley	100	Cedar	....
Center	20	Dubuque	....
Centerdale	30	Cedar	....
Center Grove	.....	Dubuque	....

Center Junction	199	Jones	*
Center Point	802	Linn	*
Centerville	6,936	Appanoose	***
Central City	558	Linn	*
Centralia	100	Dubuque	....
Chamberlain	.....	Dallas	....
Chancy	.....	Clinton	....
Chapin	275	Franklin	....
Chariton	3,794	Lucas	**
Charles City	5,892	Floyd	**
Charlston	100	Lee	....
Charlotte	356	Clinton	*
Charter Oak	734	Crawford	*
Chatsworth	131	Sioux	....
Chautauqua	.....	Pottawattamie	....
Chelsea	507	Tama	*
Chequest	14	Davis	....
Cherokee	4,884	Cherokee	**
Chester	266	Howard	*
Chester Center	.....	Poweshiek	....
Chickasaw	76	Chickasaw	....
Chillicothe	181	Wapello	....
Chisholm	.....	Monroe	....
Church	25	Allamakee	....
Churchville	75	Warren	....
Churdan	667	Greene	†
Cincinnati	1,355	Appanoose	....
Clara	.....	Pottawattamie	....
Clare	299	Webster	....
Clarence	662	Cedar	*
Clarinda	3,832	Page	**
Clarion	2,065	Wright	***
Clark	.....	Mills	....
Clarkdale	175	Appanoose	....
Clarkson	30	Warren	....
Clarksville	895	Butler	*
Clay	150	Washington	....
Clayford	.....	Jones	....
Clay Mills	.....	Jones	....
Clayton	145	Clayton	....
Clayworks	50	Webster	....
Clearfield	625	Taylor	....
Clear Lake	2,014	Cerro Gordo	***
Cleghorn	186	Cherokee	....
Clemons	213	Marshall	....
Clemons Grove	.....	Marshall	....
Clermont	510	Fayette	....
Cleveland	59	Lucas	....
Cleves	75	Hardin	....
Cliffland	.....	Wapello	....
Climax	28	Montgomery	....
Climbing Hill	83	Woodbury	....
Clinton	25,577	Clinton	**
Clinton Center	.....	Wayne	....
Clio	178	Wayne	*
Clive	27	Polk	....
Cloud	15	Marion	....
Cloverdale	.....	Osceola	....
Clover Hills	300	Polk	....
Clutier	186	Tama	*
Clyde	25	Jasper	....
Coal City	35	Appanoose	....
Coal Creek	65	Keokuk	....
Coalfield	.....	Monroe	....
Coalville	325	Webster	....
Coburg	177	Montgomery	....
Coggon	471	Linn	*
Coin	591	Page	*
Cole	.....	Henry	....
Colesburg	271	Delaware	....
Colfax	2,524	Jasper	**
College Springs	626	Page	....
Collett	.....	Jefferson	....
Collins	521	Story	*
Colo	463	Story	....
Columbia	.....	Keokuk	....
Columbia	200	Marion	....
Columbus City	375	Louisa	....
Columbus Junction	1,185	Louisa	**
Commerce	150	Polk	....
Communia	59	Clayton	....
Conesville	347	Muscatine	....
Confidence	75	Wayne	....
Conger	41	Warren	....
Connables	.....	Lee	....
Connor	.....	Allamakee	....
Connover	172	Winneshiek	....
Conrad	549	Grundy	*

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus *** †Bonds voted.

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Conroy	21	Iowa	....
Conway	283	Taylor	....
Conway Crossing	.....	Taylor	....
Cool	35	Warren	....
Coon Rapids	1,084	Carroll	*
Cooper	150	Greene	....
Coppock	105	Henry	....
Cora	.....	Pocahontas	....
Coralville	151	Johnson	....
Cordova	43	Marion	....
Corley	80	Shelby	....
Cornelia	37	Wright	....
Cornell	.....	Clay	....
Corning	1,702	Adams	**
Correctionville	893	Woodbury	*
Corwith	455	Hancock	*
Corydon	1,669	Wayne	***
Cosgrove	26	Johnson	....
Coster	.....	Butler	....
Cottage	.....	Hardin	....
Cottage Grove	.....	Scott	....
Cottage Hill	.....	Dubuque	....
Cotter	200	Louisa	....
Cottonville	61	Jackson	....
Cottonwood	35	Lee	....
Cou Falls	50	Johnson	....
Coulson	10	Cherokee	....
Coulter	198	Franklin	....
Council Bluffs	29,292	Pottawattamie	**
County Line	62	Jefferson	....
Covington	31	Linn	....
Craig	.....	Plymouth	....
Crain Creek	25	Black Hawk	....
Cranston	.....	Muscatine	....
Crathorne	.....	Plymouth	....
Crawfordsville	322	Washington	....
Crescent	300	Pottawattamie	....
Cresco	2,658	Howard	***
Creston	6,924	Union	**
Cricket	200	Mahaska	....
Crippen	.....	Palo Alto	....
Crisp	8	Harrison	....
Crocker	46	Polk	....
Cromwell	208	Union	....
Crooks	.....	Webster	....
Croton	106	Lee	....
Crown	.....	Decatur	....
Crozier	10	Buena Vista	....
Crystal	.....	Tama	....
Crystal Lake	143	Hancock	....
Culver	.....	Muscatine	....
Cumberland	552	Cass	*
Cumming	200	Warren	....
Curlew	161	Palo Alto	....
Curtis	.....	Johnson	....
Cushing	254	Woodbury	*
Cylinder	129	Palo Alto	....
Dahlonega	.....	Wapello	....
Dairyville	.....	Grundy	....
Dakota	391	Humboldt	....
Dale	77	Guthrie	....
Dale	.....	Scott	....
Dallas	250	Marion	....
Dallas Center	769	Dallas	....
Dalton	75	Plymouth	....
Dana	183	Greene	....
Danbury	558	Woodbury	*
Danforth	.....	Johnson	....
Danville	263	Des Moines	....
Darbyville	200	Appanoose	....
Davenport	43,028	Scott	**
David	150	Mitchell	....
Davis City	489	Decatur	*
Davis Corners	27	Howard	....
Dawson	275	Dallas	....
Dayton	717	Webster	**
Daytonville	100	Washington	....
Dean	75	Appanoose	....
Decatur	311	Decatur	....
Decorah	3,592	Winneshiek	**
Dedham	355	Carroll	*
Deep River	467	Poweshiek	*
Deercreek	40	Worth	....
Deerfield	20	Chickasaw	....
Defiance	411	Shelby	*
Dekalb	35	Decatur	....
Delano	.....	Winnebago	....
Delaware	221	Delaware	....
Delhi	375	Delaware	....
Delmar	548	Clinton	*
Deloit	208	Crawford	....
Delphos	120	Ringgold	....
Delta	728	Keokuk	....
Denison	3,133	Crawford	**
Denmark	350	Lee	....
Dennis	.....	Appanoose	....
Denova	50	Henry	....
Denver	224	Bremer	*
Depew	.....	Palo Alto	....
Derby	326	Lucas	....
Des Moines	86,368	Polk	**†
De Sota	356	Dallas	....
Devon	57	Chickasaw	....
Dewar	75	Black Hawk	....
Dewey	15	Cass	....
Dewitt	1,634	Clinton	***
Dexter	767	Dallas	....
Diagonal	509	Ringgold	....
Diamond	.....	Appanoose	....
Dickens	255	Clay	....
Diff	25	Appanoose	....
Digby	.....	Johnson	....
Dike	286	Grundy	*
Dillon	75	Marshall	....
Dinsdale	75	Tama	....
Divide	.....	Dickinson	....
Dixie	31	Mitchell	....
Dixon	198	Scott	....
Dodgeville	113	Des Moines	....
Dolliver	107	Emmet	....
Donahue	64	Scott	....
Donley	.....	Marion	....
Donnan	30	Fayette	....
Donnelley	.....	Marion	....
Donnellson	337	Lee	*
Doon	581	Lyon	*
Doran	.....	Mitchell	....
Dorchester	90	Allamakee	....
Doris	.....	Buchanan	....
Dotson	.....	Jasper	....
Doubleday	.....	Floyd	....
Douds Leando	450	Van Buren	....
Dougherty	171	Cerro Gordo	....
Douglass	250	Fayette	....
Dover	15	Lee	....
Dow City	462	Crawford	*
Downey	200	Cedar	....
Dows	892	Wright	*
Drakesville	249	Davis	....
Dresden	.....	Chickasaw	....
Drew	.....	Wright	....
Dublin	58	Washington	....
Dubuque	38,494	Dubuque	**
Dudley	60	Wapello	....
Duggan	.....	Jackson	....
Dumfries	75	Pottawattamie	....
Dumont	550	Butler	*
Dunbar	52	Marshall	....
Duncan	.....	Hancock	....
Duncombe	418	Webster	*
Dundee	375	Delaware	....
Dunkerton	276	Black Hawk	....
Dunlap	1,155	Harrison	*
Dunreath	200	Marion	....
Durango	200	Dubuque	....
Durant	720	Cedar	*
Durham	105	Marion	....
Dyersville	1,511	Dubuque	**

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus *** †Sewage disposal not provided for main sewer system. Sewage disposal provided for two of the smaller sewer systems

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Dysart	906	Tama	*
Eagle Center	75	Black Hawk	....
Eagle Grove	3,387	Wright	**
Eagle Point	.....	Dubuque	....
Earlham	749	Madison	*
Earling	323	Shelby	*
Earlville	552	Delaware	*
Early	500	Sac	*
Easley	.....	Calhoun	....
East Amana	.....	Iowa	....
East Atlantic	.....	Cass	....
East Clayton	.....	Clayton	....
East Peru	371	Madison	....
E. Pleasant Plain	250	Jefferson	....
Echo	.....	Harrison	....
Eckards	.....	Clayton	....
Eddyville	1,085	Wapello	*
Eden	30	Fayette	....
Edenville	448	Marshall	....
Edgewood	555	Clayton	....
Edmore	.....	Dubuque	....
Edna	35	Lyon	....
Edwards	.....	Black Hawk	....
Egan	.....	Allamakee	....
Ehler	100	Delaware	....
Elanor	.....	Butler	....
Elberon	336	Tama	*
Eldergrove	.....	Allamakee	....
Eldon	2024	Wapello	*†
Eldora	1,995	Hardin	**
Eldorado	150	Fayette	....
Eldridge	217	Scott	*
Elgin	564	Fayette	*
Elk	.....	Decatur	....
Elkader	1,181	Clayton	**
Elkhart	132	Polk	....
Elk Horn	400	Shelby	....
Elkport	210	Clayton	....
Elk River Jct	.....	Clinton	....
Elkton	.....	Buena Vista	....
Ellendale	.....	Plymouth	....
Ellington	.....	Hancock	....
Elliott	528	Montgomery	*
Ellis	.....	Hardin	....
Ellmaker	.....	Jefferson	....
Ells	12	Crawford	....
Ellston	205	Ringgold	....
Ellsworth	406	Hamilton	*
Ellsworth	.....	Wright	....
Elma	807	Howard	*
Elmira	.....	Johnson	....
Elmsprings	.....	Sioux	....
Elon	18	Allamakee	....
Elrick	27	Louisa	....
Elvira	31	Clinton	....
Elwell	.....	Story	....
Elwood	200	Clinton	....
Ely	161	Linn	....
Emeline	17	Jackson	....
Emerson	478	Mills	....
Emery	.....	Cerro Gordo	....
Emmetsburg	2,325	Palo Alto	***
Emna	.....	Dubuque	....
Enod	.....	Taylor	....
Enterprise	300	Polk	....
Epworth	520	Dubuque	*
Erastus	.....	Guthrie	....
Ericson	.....	Boone	....
Ernie	.....	Floyd	....
Essex	776	Page	**

Estherville	3,404	Emmet	**
Eureka	.....	Adams	....
Evander	.....	O'Brien	....
Evans	600	Mahaska	....
Evanston	40	Webster	....
Eveland	80	Mahaska	....
Evergreen	.....	Tama	....
Everist	.....	Marion	....
Everly	392	Clay	....
Ewart	100	Poweshiek	....
Excelsior	.....	Mahaska	....
Exira	787	Audubon	*
Exline	660	Appanoose	....
Fairbank	618	Buchanan	*
Fairfax	300	Linn	....
Fairfield	4,970	Jefferson	***
Fairmount	44	Jasper	....
Fairport	200	Muscatine	....
Fairview	200	Jones	....
Fairville	50	Palo Alto	....
Fallow	21	Palo Alto	....
Fanslers	150	Guthrie	....
Farley	676	Dubuque	*
Farlin	100	Greene	....
Farmersburg	259	Clayton	*
Farmington	1,165	Van Buren	*
Farnam	.....	Scott	....
Farnhamville	332	Calhoun	....
Farragut	431	Fremont	....
Farrar	.....	Polk	....
Farson	150	Wapello	....
Faulkner	54	Franklin	....
Fayette	1,112	Fayette	*
Fenton	211	Kossuth	*
Ferguson	127	Marshall	....
Fern	75	Story	....
Fernald	75	Story	....
Ferry	.....	Mahaska	....
Fertile	207	Worth	....
Festino	141	Winneshiek	....
Fielding	12	Cherokee	....
Fifield	.....	Marion	....
Fifteen Mile	35	Tama	....
Filmore	50	Dubuque	....
Finchford	100	Black Hawk	....
Findley	.....	Harrison	....
Fiscus	10	Audubon	....
Fishville	.....	Mahaska	....
Fisk	28	Adair	....
Flagler	300	Marion	....
Flanders	.....	Woodbury	....
Flemingville	.....	Linn	....
Flint	.....	Cerro Gordo	....
Flint	.....	Mahaska	....
Florence	.....	Wright	....
Florenceville	50	Howard	....
Floris	306	Davis	....
Floyd	332	Floyd	....
Flugstad	20	Webster	....
Folletts	50	Clinton	....
Folsom	25	Mills	....
Fonda	978	Pocahontas	*
Fontanelle	789	Adair	*
Foote	25	Iowa	....
Forbush	.....	Appanoose	....
Ford	75	Warren	....
Forest City	1691	Winnebago	**
Forest Home	.....	Poweshiek	....
Forest Mills	25	Allamakee	....
Forestville	30	Delaware	....
Forsyth	.....	Emmet	....
Fort Atkinson	289	Winneshiek	....
Fort Des Moines	.....	Polk	....
Fort Dodge	15543	Webster	**
Fort Madison	8900	Lee	**
Fosselman	.....	Black Hawk	....
Foster	276	Monroe	....
Fosterdale	.....	Marion	....
Fostoria	200	Clay	....
Four Corners	35	Jefferson	....
Fraker	.....	Monroe	....
Franklin	138	Lee	....
Franklin	.....	Jasper	....
Franklin Sta.	35	Lee	....
Frank Pierce	45	Johnson	....
Frankville	171	Winneshiek	....
Fraser	527	Boone	....
Fraser Sta.	.....	Boone	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus *** †Only part sewered.

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Fredericksburg	558	Chickasaw	*
Frederika	149	Bremer	....
Fredonia	200	Louisa	....
Frederick	100	Monroe	....
Fredsville	30	Grundy	....
Freeman	22	Cerro Gordo	....
Freeport	50	Winneshiek	....
Freemont	501	Mahaska	....
Freemont	.....	Jones	....
French Creek	.....	Allamakee	....
Frendale	11	Johnson	....
Froelich	43	Clayton	....
Fruitland	200	Muscatine	....
Fuller	.....	Mitchell	....
Fulton	150	Jackson	....
Galbraith	.....	Kossuth	....
Galesburg	150	Jasper	....
Galion	.....	Cass	....
Galland	90	Lee	....
Galt	300	Wright	....
Galva	357	Ida	**
Gambril	30	Scott	....
Garber	131	Clayton	....
Garden City	200	Hardin	....
Garden City	.....	Louisa	....
Garden Grove	611	Decatur	....
Gardener	.....	Dallas	....
Garfield	.....	Appanoose	....
Garland	.....	Des Moines	....
Garnavillo	342	Clayton	....
Garner	1,028	Hancock	*
Garrison	438	Benton	....
Garry Owen	57	Jackson	....
Garwin	425	Tama	*
Gates	.....	Audubon	....
Gaza	150	O'Brien	....
Gear	18	Madison	....
Gehlen	.....	Plymouth	....
Geneva	199	Franklin	....
Genoa	50	Wayne	....
Genoa Bluff	52	Iowa	....
George	606	Lyon	*
Georgetown	45	Monroe	....
Gerled	50	Kossuth	....
Germania	436	Kossuth	....
Germantown	55	O'Brien	....
Germanville	.....	Jefferson	....
Geard	120	Clayton	....
Gibson	115	Keokuk	....
Gifford	150	Hardin	....
Gilbert	.....	Scott	....
Gilbert	235	Story	*
Gilbertville	200	Black Hawk	....
Gilead	.....	Adair	....
Gillet Grove	150	Clay	....
Gilliat	.....	Pottawattamie	....
Gilman	430	Marshall	*
Gilmore City	689	Pocahontas	*
Giltedge	.....	Delaware	....
Givin	176	Mahaska	....
Gladbrook	869	Tama	*
Glade	.....	Worth	....
Gladstone	50	Tama	....
Gladwin	.....	Louisa	....
Glasgow	.....	Black Hawk	....
Glasgow	100	Jefferson	....
Glendale	50	Jefferson	....
Glendon	50	Guthrie	....
Glenellen	25	Woodbury	....
Glenwood	4,052	Mills	**
Glidden	850	Carroll	*
Goddard	.....	Jasper	....
Golden	.....	Delaware	....
Goldfield	681	Wright	....
Goodell	240	Hancock	....
Goodwin	.....	Polk	....
Goose Lake	110	Clinton	*
Gordens Ferry	.....	Jackson	....
Goshen	.....	Ringgold	....
Gosport	35	Marion	....
Gowrie	829	Webster	*
Grable	8	Pottawattamie	....
Gracehill	75	Washington	....
Graettinger	556	Palo Alto	*
Graf	47	Dubuque	....
Grafton	183	Worth	....
Graham	30	Clayton	....
Grand Junction	1,012	Greene	*
Grand Mound	428	Clinton	*
Grand River	333	Decatur	....
Grand View	374	Louisa	....
Grenger	225	Dallas	....
Granite	51	Lyon	....
Grant	375	Montgomery	....
Grant Center	42	Monona	....
Grant City	162	Sac	....
Granville	400	Sioux	*
Gravel Dale	.....	Greene	....
Gravity	475	Taylor	....
Gray	148	Audubon	....
Grayson	.....	Boone	....
Greasers	.....	Benton	....
Greeley	383	Delaware	....
Greencastle	25	Jasper	....
Greene	1,150	Butler	***
Greenfield	1,370	Adair	*
Green Island	128	Jackson	....
Green Mountain	100	Marshall	....
Greenvale	.....	Dallas	....
Greenville	200	Clay	....
Gridley	75	Emmet	....
Griffin	.....	Boone	....
Griffinsville	35	Appanoose	....
Griffith	.....	Emmet	....
Grimes	733	Polk	*
Grinnell	5,036	Poweshiek	***
Griswold	949	Cass	*
Grovehill	65	Bremer	....
Groveland	.....	Clark	....
Grundy Center	1,354	Grundy	***
Gruver	130	Emmet	....
Guernsey	143	Poweshiek	....
Gunder	75	Clayton	....
Guss	75	Taylor	....
Guthrie Center	1,337	Guthrie	***
Guttenberg	1,873	Clayton	*
Gypsum	25	Webster	....
Hadden Hill	.....	Dallas	....
Hagerty	.....	Dickinson	....
Hagerty	.....	Monroe	....
Hahns	.....	Muscatine	....
Halbur	147	Carroll	*
Hales	100	Jones	....
Haley	.....	Crawford	....
Halfa	50	Emmet	....
Hamburg	1,817	Fremont	**
Hammerville	.....	Buchanan	....
Hamil	150	Lee	....
Hamilton	391	Marion	....
Hamlin	150	Audubon	....
Hampton	2,617	Franklin	***
Hancock	250	Pottawattamie	....
Haneys	.....	Mills	....
Hanford	50	Cerro Gordo	....
Hanley	95	Madison	....
Hanlontown	129	Worth	....
Hanna	.....	Kossuth	....
Hanover	25	Buena Vista	....
Hansell	150	Franklin	....
Hansen Heights	.....	Audubon	....
Harcourt	247	Webster	....
Hardin	.....	Clayton	....
Hardy	150	Humboldt	....
Harkes	75	Appanoose	....
Harl	.....	Sac	....
Harlan	2,570	Shelby	**
Harmons	.....	Clinton	....
Harper	232	Keokuk	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Harpers Ferry	297	Allamakee	....
Harris	239	Osceola	*
Harrisdale	.....	Cass	....
Harrison	16	Madison	....
Hartford	100	Warren	....
Hartley	1,106	O'Brien	....
Hartwick	200	Poweshiek	**
Harvard	125	Wayne	....
Harvey	346	Marion	....
Haskins	150	Washington	....
Hastie	42	Polk	....
Hastings	393	Mills	....
Havelock	241	Pocahontas	....
Haven	75	Tama	....
Haverhill	100	Marshall	....
Havre	50	Washington	....
Hawarden	2,107	Sioux	....
Hawkeye	510	Fayette	**
Hawley	.....	Hancock	*
Hawleyville	125	Page	....
Hawthorne	35	Montgomery	....
Hayes	18	Adams	....
Hayesville	150	Keokuk	....
Hayfield	200	Hancock	....
Hayfield Jct.	.....	Hancock	....
Haynies	.....	Mills	....
Hayward	.....	Dickinson	....
Hazelgreen	36	Delaware	....
Hazleton	444	Buchanan	....
Hebron	66	Adair	....
Hedge	.....	Iowa	....
Hedrick	978	Keokuk	....
Henderson	240	Mills	*
Henshaw	.....	Taylor	....
Hentons	.....	Mills	....
Hepburn	110	Page	....
Herndon	100	Guthrie	....
Herrin	40	Sac	....
Herrold	.....	Polk	....
Hesper	200	Winneshiek	....
Heytmans	.....	Allamakee	....
Hiattsville	.....	Appanoose	....
Hickory	.....	Monroe	....
Hicks	.....	Black Hawk	....
High	.....	Iowa	....
High Bridge	.....	Dallas	....
High Creek	.....	Fremont	....
Highland	25	Clayton	....
Highland	.....	Wapello	....
Highland Cen.	150	Wapello	....
Highlandville	150	Winneshiek	....
Highley	.....	Jasper	....
High Point	30	Decatur	....
High View	57	Hamilton	....
Hills	195	Johnson	....
Hillsboro	600	Henry	....
Hillsdale	80	Mills	....
Hilton	.....	Monroe	....
Hinsdale	.....	Lee	....
Hinton	329	Plymouth	*
Hiteman	1,000	Monroe	....
Hobart	46	Kossuth	....
Hocking	800	Monroe	....
Holbrook	50	Iowa	....
Holland	168	Grundy	....
Holly Springs	75	Woodbury	....
Holmes	120	Wright	....
Holstein	936	Ida	***
Holt	.....	Taylor	....
Holy Cross	143	Dubuque	*

Homer	75	Hamilton	....
Homestead	300	Iowa	....
Honey Creek	100	Pottawattamie	....
Hope	.....	Greene	....
Hopeville	103	Clarke	....
Hopkinton	797	Delaware	*
Hoprig	25	Emmet	....
Hornick	245	Woodbury	....
Horrabin	.....	Johnson	....
Horton	100	Bremer	....
Hospers	581	Sioux	*
Houghton	50	Lee	....
Howe	.....	Adair	....
Howell	.....	Marion	....
Hoyt	.....	Adams	....
Hubbard	568	Hardin	*
Hudson	372	Black Hawk	*
Hugh	.....	Sac	....
Hughes	15	Hardin	....
Hugo	.....	Jackson	....
Hull	658	Sioux	*
Humboldt	1,809	Humboldt	*
Humeston	1,006	Wayne	*
Hunters	15	Dickinson	....
Huntington	150	Emmet	....
Hurley	.....	Cerro Gordo	....
Huron	.....	Des Moines	....
Hurtsville	185	Jackson	....
Hustad	65	Mitchell	....
Hutchins	.....	Hancock	....
Huxley	336	Story	....
Hynes	400	Monroe	....
Iconium	125	Appanoose	....
Ida Grove	1,874	Ida	**
Illyria	.....	Fayette	....
Imogene	341	Fremont	....
Independence	3,517	Buchanan	**
Indianapolis	100	Mahaska	....
Indianola	3,283	Warren	***
Industry	50	Webster	....
Ingersoll	.....	Dallas	....
Inwood	595	Lyon	*
Ioka	.....	Keokuk	....
Ion	116	Allamakee	....
Ionia	298	Chickasaw	....
Iowa Center	100	Story	....
Iowa City	10,091	Johnson	**
Iowa Falls	2,797	Hardin	**
Iowa Jct.	.....	Washington	....
Ira	140	Jasper	....
Ireton	631	Sioux	*
Irma	.....	Bremer	....
Iron Hills	87	Jackson	....
Irving	114	Tama	....
Irvington	94	Kossuth	....
Irwin	278	Shelby	....
Island Park	.....	Pottawattamie	....
Ivester	.....	Grundy	....
Iveyville	30	Adams	....
Ivy	25	Polk	....
Jackson	.....	Linn	....
Jackson Jct.	160	Winneshiek	....
Jacksonville	75	Shelby	....
Jacobs	21	Poweshiek	....
Jamaica	379	Guthrie	....
James	35	Plymouth	....
James	.....	Scott	....
Jamestown	100	Scott	....
Jamison	61	Clarke	....
Janesville	269	Bremer	....
Jay	23	Clarke	....
Jeff	.....	Fayette	....
Jefferson	2,477	Greene	***
Jerico	100	Chickasaw	....
Jerome	300	Appanoose	....
Jesup	697	Buchanan	*
Jewell Jct.	941	Hamilton	*
Jobes	.....	Guthrie	....
Johnsonville	.....	Crawford	....
Johnston	.....	Polk	....
Joice	300	Worth	....
Jolley	250	Calhoun	....
Jordan	25	Boone	....
Jubilee	50	Black Hawk	....
Judd	29	Webster	....
Judith	.....	Mahaska	....
Julien	41	Dubuque	....
Junction	.....	Fayette	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Junction Switch	.....	Jones	....
Juniata	50	Buena Vista	....
Kains	.....	Allamakee	....
Kalo	300	Webster	.
Kalo Jct.	.....	Webster	.
Kalona	466	Washington	....
Kamrar	262	Hamilton	*
Kanawha	398	Hancock	*
Kasson	25	Madison	....
Keb	.....	Wapello	....
Keen	63	Polk	....
Kellerton	503	Ringgold	....
Kelley	231	Story	....
Kellogg	610	Jasper	*
Kemigala	.....	Appanoose	....
Kemling	.....	Pottawattamie	....
Kemper	.....	Des Moines	....
Kendalville	86	Winneshiek	....
Kennebec	.....	Monona	....
Kennedy	.....	Dallas	....
Kensett	360	Worth	....
Kent	158	Union	....
Kentner	.....	Carroll	....
Kenwood	52	Crawford	....
Kenwood	136	Linn	....
Kenwood Park	376	Linn	*
Keokuk	14,008	Lee	**
Keosauqua	1,009	Van Buren	*
Keota	988	Keokuk	*
Keown	.....	Pottawattamie	....
Kesley	200	Butler	....
Keswick	500	Keokuk	....
Ketcham	.....	Henry	....
Kew	.....	Ringgold	....
Keystone	412	Benton	*
Keywest	100	Dubuque	....
Kidder	.....	Dubuque	....
Kiene	.....	Buchanan	....
Kier	.....	Buchanan	....
Kilbourn	69	Van Buren	....
Kilduff	80	Jasper	....
Kimbalton	271	Audubon	*
King	.....	Dubuque	....
Kingsley	977	Plymouth	***
Kingston	.....	Decatur	....
Kingston	70	Des Moines	....
Kinross	142	Keokuk	....
Kirkman	180	Shelby	*
Kirkville	299	Wapello	....
Kirkville Sta.	.....	Wapello	....
Kirkwood	.....	Appanoose	....
Kiron	207	Crawford	*
Klemme	306	Hancock	*
Kline	.....	Des Moines	....
Klinger	50	Bremer	....
Klondike	50	Lyon	....
Knieram	220	Calhoun	....
Knifflin	.....	Wayne	....
Knittel	30	Bremer	....
Knoke	14	Calhoun	....
Knowlton	193	Ringgold	....
Knox	25	Fremont	....
Knoxville	3190	Marion	***
Konigsmark	.....	Linn	....
Kossuth	248	Des Moines	....
Koszta	.....	Iowa	....
Koyle	.....	Decatur	....
Kunze	.....	Crawford	....
Lacelle	31	Clarke	....
Lacey	100	Mahaska	....

Lacona	517	Warren	....
LaCrew	45	Lee	....
Laddsdale	200	Davis	....
Ladoga	12	Taylor	....
Ladora	260	Iowa	....
Lafayette	75	Linn	....
La Hovt	.....	Henry	....
Lansville	.....	Jackson	....
Lake City	2043	Calhoun	*
Lake Mills	1214	Winnebago	*
Lake Park	552	Dickinson	*
Lake Port	.....	Woodbury	....
Lakeside	.....	Buena Vista	....
Lake Okoboji	.. 150	Dickinson	....
Lake View	514	Sac	*
Lakewood	251	Lyon	....
Lakonta	200	Mahaska	....
Lamoille	100	Marshall	....
Lamoni	1541	Decatur	***
Lamont	571	Buchanan	*
Lamotte	288	Jackson	*
Lancaster	.....	Keokuk	
Lancsboro	288	Carroll	....
Langdon	.....	Jones	....
Langworthy	100	Allamakee	**
Lansing	1542	Worth	....
Lansrud	.....	Webster	....
La Porte City	1233	Black Hawk	**
Larchwood	434	Lyon	....
Lark	.....	Worth	....
Larland	30	Audubon	..
Larrabee	158	Cherokee	....
Latimer	378	Franklin	*
Lattners	25	Dubuque	....
Latty	36	Des Moines	....
Laurel	179	Marshall	....
Laurenz	817	Pocahontas	*
Lavinia	120	Calhoun	....
Lawler	601	Chickasaw	*
Lawnhill	.61	Hardin	....
Lawton	138	Woodbury	*
Leando	150	Van Buren	....
Lear	.....	Grundy	....
Lebanon	92	Van Buren	....
Le Claire	690	Scott	....
Ledyard	222	Kossuth	*
Lee	25	Ringgold	....
Leeds	.....	Woodbury	....
Legrand	338	Marshall	....
Lehigh	928	Webster	**
Leighton	204	Mahaska	....
Leland	188	Winnebago	....
Lemars	4157	Plymouth	**
Lena	24	Webster	....
Lenox	1274	Taylor	**
Leon	1991	Decatur	***
Leonard	.....	Taylor	....
Leroy	185	Decatur	....
Leslie	100	Clarke	....
Lester	.....	Black Hawk	....
Lester	244	Lyon	*
Letts	433	Louisa	....
Leverett	.....	Buena Vista	....
Levey	32	Polk	....
Lewis	.603	Cass	*
Lewisburg	.....	Wayne	....
Lexington	50	Washington	....
Liberty	.....	Clarke	....
Liberty Center	175	Warren	....
Libertyville	300	Jefferson	....
Lida	.....	Warren	....
Lidderdale	114	Carroll	....
Lima	75	Fayette	....
Lime City	.....	Cedar	....
Lime Springs	498	Howard	*
Linby	100	Jefferson	....
Lincoln	.....	Grundy	....
Linden	315	Dallas	....
Lineville	600	Wayne	....
Linburg	260	Webser	....
Linn Grove	500	Buena Vista	....
Linn Jct.	15	Linn	....
Linwood	.....	Adair	....
Linwood	.....	Scott	....
Lisbon	846	Linn	*
Liscomb	354	Marshall	....
Little Cedar	200	Mitchell	....
Littleport	166	Clayton	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Little Rock	471	Lyon	*
Little Sioux	390	Harrison	*
Littleton	94	Buchanan	....
Little Turkey	25	Chickasaw	....
Livermore	578	Humboldt	*
Living Spring	.....	Pottawattamie	....
Livingston	83	Appanoose	....
Lizard	.....	Pocahontas	....
Lockman	150	Monroe	....
Lockridge	300	Jefferson	....
Locust	.....	Winneshiek	....
Logan	1,453	Harrison	**
Lohrville	674	Calhoun	*
Lonerock	250	Kossuth	....
Lone Tree	782	Johnson	*
Long Grove	300	Scott	....
Long Point	10	Tama	....
Longview	.....	Van Buren	....
Lorah	50	Cass	....
Lore	75	Dubuque	....
Lorimor	645	Union	....
Loring	.....	Polk	....
Lossing	15	Monona	....
Lost Creek	.....	Mahaska	....
Lost Nation	523	Clinton	**
Lothrop	.....	Warren	....
Lotts Creek	100	Kossuth	....
Louisa	.....	Linn	....
Louise	.....	Black Hawk	....
Lourdes	35	Howard	....
Loveland	100	Pottawattamie	....
Lovilla	552	Monroe	....
Lowden	584	Cedar	....
Lowell	125	Henry	....
Low Moor	253	Clinton	....
Lowther	.....	Howard	....
Luana	200	Clayton	....
Lucas	666	Lucas	....
Luckyvalley	.....	Woodbury	....
Ludlow	27	Allamakee	....
Lundgren	.....	Webster	....
Lunsford	.....	Davis	....
Luray	.....	Marshall	....
Luther	130	Boone	*
Luthon	150	Woodbury	....
Luverne	501	Kossuth	....
Luxemberg	150	Dubuque	....
Luzerne	160	Benton	....
Lycurgus	50	Allamakee	....
Lyman	30	Cass	....
Lyndale	.....	Allamakee	....
Lynnville	370	Jasper	....
Lynville Jct.	.....	Jasper	....
Lyons	4,800	Clinton	*
Lytton	500	Sac	....
McArthurs	.....	Scott	....
McBride	.....	Madison	....
McCallsburg	309	Story	....
McCausland	106	Scott	....
McClelland	134	Pottawattamie	....
McClay	.....	Sac	....
McGregor	1,259	Clayton	*
McIntire	487	Mitchell	....
McNally	.....	Sioux	....
McNamara	.....	Linn	....
McPaul	100	Fremont	....
McPherson	.....	Montgomery	....
McVeigh	.....	Van Buren	....
Macedonia	357	Pottawattamie	*
Mackey	50	Boone	....
Macksburg	197	Madison	....
Maclay	.....	Clay	....
Macuta	.....	Lee	....
Macey	25	Hardin	....
Madrid	1,191	Boone	*
Magill	.....	Harrison	....
Magnolia	311	Harrison	....
Maine	.....	Appanoose	....
Malcom	377	Poweshiek	*
Mallard	331	Palo Alto	*
Malone	67	Clinton	....
Maloy	127	Ringgold	....
Malta	.....	Marshall	....
Malvern	1,154	Mills	**
Mammen	35	Plymouth	....
Manchester	2,758	Delaware	**
Manhattan	.....	Dickinson	....
Manilla	875	Crawford	*
Manly	346	Worth	*
Manning	1,434	Carroll	**
Manson	1,236	Calhoun	*
Maplegrove	.....	Madison	....
Maple Hill	25	Emmet	....
Maple Landing	37	Monona	....
Mapleleaf	24	Howard	....
Maple River	105	Carroll	....
Mapleton	1,100	Monona	*
Maquoketa	3,570	Jackson	**
Marathon	532	Buena Vista	*
Marble Rock	480	Floyd	*
Marcus	896	Cherokee	**
Marengo	1,786	Iowa	*
Marietta	50	Marshall	....
Marion	4,400	Linn	***
Mark	45	Davis	....
Marker	.....	Cass	....
Marne	266	Cass	*
Marquisville	25	Polk	....
Marsh	50	Louisa	....
Marshalltown	13,374	Marshall	**
Martelle	178	Jones	....
Martins	.....	Scott	....
Martinsburg	285	Keokuk	....
Marysville	319	Marion	....
Maryville Jct.	.....	Marion	....
Mason City	11,230	Cerro Gordo	**
Masonville	282	Delaware	....
Massena	490	Cass	....
Massey	.....	Dubuque	....
Massilon	100	Cedar	....
Matlock	118	Sioux	....
Maud	12	Allamakee	....
Maulsby	.....	Marshall	....
Maurice	290	Sioux	....
Max	.....	O'Brien	....
Maxon	.....	Monroe	....
Maxwell	754	Story	*
May City	65	Osceola	....
Maynard	382	Fayette	....
Maysville	55	Scott	....
Mechanicsville	817	Cedar	*
Mederville	200	Clayton	....
Medford	.....	Warren	....
Mediapolis	858	Des Moines	**
Medora	61	Warren	....
Meigs	.....	Lee	....
Melbourne	423	Marshall	....
Melcher	600	Marion	....
Melleray	.....	Dubuque	....
Mellrose	459	Monroe	....
Melton	.....	Worth	....
Meltonville	75	Worth	....
Melvin	195	Osceola	....
Menlo	382	Guthrie	....
Mentor	.....	Bremer	....
Mercer	.....	Adams	....
Meriden	246	Cherokee	....
Meroa	30	Mitchell	....
Merril	520	Plymouth	*
Merrimac	75	Jefferson	....
Merry	.....	Sac	....
Mertensville	.....	Lee	....
Merservey	193	Cerro Gordo	*
Metz	63	Jasper	....
Meyer	387	Mitchell	....
Middle Amana	.....	Iowa	....
Middleburg	.....	Sioux	....
Middlefield	.....	Buchanan	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Middle Lock	.....	Lee	....
Middle River	.....	Madison	....
Middletown	175	Des Moines	....
Midland	.....	Lyon	....
Midland Jct.	.....	Clinton	....
Mid River	.....	Johnson	....
Midvale	.....	Story	....
Midway	.....	Appanoose	....
Midway	50	Woodbury	....
Miles	334	Jackson	*
Milford	575	Dickinson	*
Millard	.....	Jasper	....
Milledgeville	.....	Appanoose	....
Miller	.....	Hancock	....
Miller	150	Polk	....
Millersburg	300	Iowa	....
Millnerville	25	Plymouth	....
Millville	90	Clayton	....
Milo	519	Warren	....
Milton	913	Van Buren	....
Minburn	388	Dallas	....
Minden	423	Pottawattamie	*
Mineola	150	Mills	....
Mineral Ridge	117	Boone	....
Minerva	30	Marshall	....
Minerva Jct.	.....	Marshall	....
Mingo	246	Jasper	....
Missouri Valley	3,187	Harrison	**
Mitchell	231	Mitchell	....
Mitchellville	869	Polk	*
Modale	387	Harrison	....
Moingona	250	Boone	....
Mona	.....	Mitchell	....
Mondamin	420	Harrison	....
Moneta	44	O'Brien	....
Monette	.....	Union	....
Moningers	.....	Marshall	....
Monmouth	221	Jackson	....
Monona	792	Clayton	*
Monroe	800	Jasper	....
Montieth	75	Guthrie	....
Monteray	75	Davis	....
Montezuma	1,172	Poweshiek	**
Montgomery	100	Dickinson	....
Monti	.....	Buchanan	....
Monticello	2,043	Jones	**
Montour	383	Tama	....
Montpelier	.....	Muscatine	....
Montrose	708	Lee	....
Mooar	250	Lee	....
Mooreville	49	Tama	....
Moorhead	366	Monona	*
Moorland	137	Webster	*
Moran	.....	Dallas	....
Moravia	682	Appanoose	....
Morgan	50	Decatur	....
Morgan Valley	25	Marion	....
Morhain	.....	Wright	....
Morley	102	Jones	....
Morningside	.....	Woodbury	....
Morning Sun	897	Louisa	....
Morrison	173	Grundy	....
Morse	91	Johnson	....
Mortimer	.....	Ringgold	....
Mortons	20	Mills	....
Moscow	150	Muscatine	....
Motor	50	Warren	....
Moulton	1,233	Appanoose	....
Mt. Auburn	228	Benton	....
Mount Ayr	1,646	Ringgold	*
Mt. Carmel	30	Carroll	....
Mount Clara	.....	Lee	....
Mount Etna	175	Adams	....
Mount Hamil	150	Lee	....
Mount Joy	100	Scott	....
Mount Pleasant	3,874	Henry	**
Mount Sterling	232	Van Buren	....
Mount Union	195	Henry	....
Mount Valley	21	Winnebago	....
Mount Vernon	1,532	Linn	***
Mount Zion	77	Van Buren	....
Moville	552	Woodbury	*
Munterville	100	Wapello	....
Murphy	.....	Jasper	....
Murray	796	Clarke	....
Muscatine	16,178	Muscatine	**
Myrtle	.....	Muscatine	....
Mystic	2,663	Appanoose	*†
Nahant	.....	Scott	....
Nanito	.....	Adair	....
Nansen	40	Chickasaw	....
Napier	.....	Boone	....
Nashua	1,102	Chickasaw	**
Nashville	100	Jackson	....
Nasset	17	Winneshiek	....
National	130	Clayton	....
Navan	.....	Winneshiek	....
Neils	.....	Winnebago	....
Nelson	.....	Guthrie	....
Nemaha	200	Sac	....
Neoga	.....	Pottawattamie	....
Neola	926	Pottawattamie	*
Neptune	54	Plymouth	....
Nevada	2,138	Story	***
Nevinville	175	Adams	....
New Albin	588	Allamakee	....
Newborn	127	Marion	....
New Boston	25	Lee	....
Newburg	200	Jasper	....
Newcom	.....	Crawford	....
Newell	728	Buena Vista	*
Newhall	375	Benton	....
New Hampton	2,275	Chickasaw	***
New Hartford	482	Butler	*
New Haven	175	Mitchell	....
Newkirk	100	Sioux	....
New Liberty	93	Scott	....
New London	1,144	Henry	*
New Market	673	Taylor	....
Newport	56	Louisa	....
New Providence	246	Hardin	....
New Sharon	1,122	Mahaska	**
Newton	4,616	Jasper	**
Newtonville	.....	Buchanan	....
New Vienna	188	Dubuque	*
New Virginia	396	Warren	....
New York	50	Wayne	....
Nichols	396	Muscatine	....
Nielly	.....	Linn	....
Niles	.....	Boone	....
Nilesville	31	Floyd	....
Nira	50	Washington	....
Noble	75	Washington	....
Nobleton	.....	Polk	....
Nodaway	323	Adams	....
Noel	35	Scott	....
Nora Junction	50	Floyd	....
Nora Springs	985	Floyd	**
Nordland	.....	Worth	....
Nordness	100	Winneshiek	....
Normal	.....	Black Hawk	....
Norman	105	Winnebago	....
Norris	.....	Black Hawk	....
North Bellevue	.....	Jackson	....
Northboro	197	Page	....
North Branch	83	Guthrie	....
N. Buena Vista	162	Clayton	....
North English	848	Iowa	*
Northfield	104	Des Moines	....
North Liberty	200	Johnson	....
North McGregor	588	Clayton	*
North Washington	132	Chickasaw	....
Northwood	1,264	Worth	*
Norwalk	315	Warren	....
Norway	479	Benton	*
Norwich	70	Page	....
Norwood	46	Lucas	....
Norwoodville	.....	Polk	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus *** †Short sewer only.

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Nuel	.....	Wright	....
Nugent	50	Keokuk	....
Numa	659	Appanoose	....
Number Ten Jct.	.....	Monroe	....
Nyman	50	Page	....
Oakdale (State Hosp.)	.....	Johnson	***
Oaks Park	.....	Clinton	....
Oak Grove	.....	Poweshiek	....
Oakland	1,105	Pottawattamie	*
Oakland Mills	30	Henry	....
Oakley	150	Lucas	....
Oakton	.....	Scott	....
Oakville	389	Louisa	....
Oasis	75	Johnson	....
Ocheydan	595	Osceola	*
Odebolt	1,283	Sac	***
Oelwein	6,028	Fayette	***
Ogden	1,298	Boone	*
Okoboji	150	Dickinson	....
Ola	.....	Lucas	....
Olaf	20	Wright	....
Oldfield	.....	Polk	....
Olds	165	Henry	....
O'Leary	40	Plymouth	....
Olin	659	Jones	**
Olivet	62	Mahaska	....
Ollie	289	Keokuk	....
Olmitz	.....	Lucas	....
Onawa	2,026	Monona	*
Oneida	200	Delaware	....
Oneida Junction	.....	Delaware	....
O'Neill	75	Dubuque	....
Oneska	.....	Mahaska	....
Onslow	207	Jones	....
Ontario	75	Story	....
Orlabor	.....	Polk	....
Oran	75	Fayette	....
Orange City	1,374	Sioux	*
Orchard	200	Mitchell	....
Ord	14	Madison	....
Orient	373	Adair	....
Orilla	23	Warren	....
Orleans	105	Dickinson	....
Ormanville	52	Wapello	....
Orrton	.....	Harrison	....
Orson	30	Harrison	....
Ortonville	.....	Dallas	....
Osage	2,445	Mitchell	***
Osborne	59	Clayton	....
Osceola	2,416	Clarke	***
Osgood	75	Palo Alto	....
Oskaloosa	9,466	Mahaska	**
Ossian	749	Winneshiek	....
Osterdock	97	Clayton	....
Oswalt	.....	Jasper	....
Otho	.....	Webster	....
Otis	.....	Linn	....
Otley	271	Marion	....
Oto	268	Woodbury	*
Otranto Station	110	Mitchell	....
Otter Creek	50	Jackson	....
Otterville	100	Buchanan	....
Ottosen	147	Humboldt	....
Ottumwa	22,012	Wapello	**
Owasa	250	Hardin	....
Owega	.....	Woodbury	....
Owen	.....	Cerro Gordo	....
Owlake	50	Humboldt	....
Oxford	614	Johnson	*
Oxford Junction	822	Jones	*

Oxford Mills	141	Jones	....
Oyens	94	Plymouth	....
Pacific City	25	Mills	....
Pacific Junction	501	Mills	....
Packard	400	Butler	....
Packwood	264	Jefferson	....
Page	100	Page	....
Page Center	100	Page	....
Palmer	177	Pocahontas	....
Palmyra	150	Warren	....
Palo	208	Linn	....
Palsville	.....	Wright	....
Panama	232	Shelby	*
Panora	1,080	Guthrie	*
Panther	36	Dallas	....
Paradise	.....	Jackson	....
Paralta	33	Linn	....
Paris	.....	Davis	....
Paris	100	Linn	....
Park	.....	Linn	....
Parkersburg	938	Butler	*
Parnell	369	Iowa	....
Parrish	.....	Des Moines	....
Paton	358	Greene	....
Patterson	147	Madison	....
Paullina	796	O'Brien	**
Payne	50	Fremont	....
Pearl City	41	Appanoose	....
Peiro	25	Woodbury	....
Pekay	.....	Mahaska	....
Pekin	100	Keokuk	....
Pella	3,021	Marion	**
Peoria	100	Mahaska	....
Peosta	62	Dubuque	....
Percival	200	Fremont	....
Percy	100	Marion	....
Perkins	.....	Sioux	....
Perlee	115	Jefferson	....
Perry	4,630	Dallas	**
Persia	358	Harrison	*
Petersburg	100	Delaware	....
Peterson	480	Clay	*
Petersville	100	Clinton	....
Pettis	.....	Sac	....
Philby	25	O'Brien	....
Phildia	.....	Dallas	....
Pickering	.....	Marshall	....
Pierceville	.....	Van Buren	....
Pierson	416	Woodbury	*
Pilotburg	.....	Washington	....
Pilot Grove	61	Lee	....
Pilot Mound	347	Boone	....
Pine Mills	35	Muscatine	....
Pioneer	92	Humboldt	....
Piper	.....	Calhoun	....
Pisgah	212	Harrison	....
Pittsburg	75	Van Buren	....
Pitzer	40	Madison	....
Placid	.....	Dubuque	....
Plainfield	288	Bremer	....
Plainview	150	Scott	....
Plano	200	Appanoose	....
Plato	50	Cedar	....
Platville	25	Taylor	....
Pleasantville Creek	.....	Jackson	....
Pleasant Grove	106	Des Moines	....
Pleasanton	200	Decatur	....
Pleasant Plain	174	Jefferson	....
Pleasant Prairie	62	Muscatine	....
Pleasant Valley	.....	Scott	....
Pleasantville	691	Marion	*
Plessis	.....	O'Brien	....
Plover	300	Pocahontas	....
Plum Creek	.....	Kossuth	....
Plymouth	358	Cerro Gordo	....
Plymouth Rock	.....	Winneshiek	....
Pocahontas	987	Pocahontas	*
Polen	25	Ringgold	....
Polk City	310	Polk	....
Pomeroy	815	Calhoun	*
Popejoy	200	Franklin	....
Poplar	14	Audubon	....
Portland	100	Cerro Gordo	....
Portsmouth	347	Shelby	*
Postville	952	Allamakee	*
Potosia	.....	Plymouth	....
Potter	.....	Tama	....
Powersville	50	Floyd	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Prairiebell	.....	Jasper	....
Prairieburg	187	Linn	*
Prairie City	764	Jasper	*
Prairie Grove	.....	Clarke	....
Prairie Rose	75	Shelby	....
Preparation	.....	Monona	....
Prescott	426	Adams	....
Preston	642	Jackson	....
Primghar	733	O'Brien	***
Primrose	165	Lee	....
Princeton	379	Scott	....
Prole	52	Warren	....
Promise City	274	Wayne	....
Protivin	163	Howard	*
Pulaski	382	Davis	....
Prussia	.....	Adair	....
Putledge	.....	Linn	....
Quandahl	100	Allamakee	....
Quarry	.....	Dallas	....
Quarry	200	Marshall	....
Quasqueton	394	Buchanan	....
Quick	36	Pottawattamie	....
Quimby	268	Cherokee	....
Quincy	70	Adams	....
Racine	.....	Buena Vista	....
Racine	.....	Hardin	....
Radcliffe	660	Hardin	*
Rake	163	Winnebago	....
Raleigh	.....	Emmet	....
Ralston	175	Carroll	....
Randalia	123	Fayette	....
Randall	250	Hamilton	....
Randolph	304	Fremont	....
Rands	25	Calhoun	....
Rathbun	382	Appanoose	....
Ratna	.....	Winnebago	....
Ray	50	Appanoose	....
Raymond	100	Black Hawk	....
Read	50	Clayton	....
Readlyn	227	Bremer	*
Reasnor	250	Jasper	....
Rector	.....	Marion	....
Redding	269	Ringgold	....
Reddy	.....	Polk	....
Redfield	659	Dallas	*
Redline	.....	Shelby	....
Red Oak	4,830	Montgomery	**
Reeder Mills	50	Harrison	....
Reels	50	Pottawattamie	....
Reeve	.....	Franklin	....
Reinbeck	1205	Grundy	***
Reinecker	.....	Hamilton	....
Relay	.....	Appanoose	....
Rembrandt	128	Buena Vista	....
Remsen	1076	Plymouth	***
Renwick	372	Humboldt	*
Republic	35	Chickasaw	....
Rhodes (Edenville)	448	Marshall	*
Riceville	844	Mitchell	*
Richards	100	Calhoun	....
Richfield	35	Fayette	....
Richland	613	Keokuk	....
Richmond	150	Washington	....
Richardsville	184	Dubuque	....
Ricketts	102	Crawford	*
Rider	.....	Polk	....
Ridgedale	15	Polk	....
Ridgeway	354	Winneshiek	....
Ridley	.....	Clayton	....
Riggs	.....	Clinton	....
Rinard	200	Calhoun	....
Ringgold	75	Ringgold	....
Ringsted	313	Emmet	*
Rippey	407	Greene	*
Rising Sun	30	Polk	....
Ritter	.....	O'Brien	....
River Junction	75	Johnson	....
Riverside	652	Washington	....
River Sioux	129	Harrison	....
Riverton	583	Fremont	....
Riverview	.....	Scott	....
Riverview	.....	Wappello	....
Rizerville	.....	Monroe	....
Robbs	.....	Emmet	....
Roberts	.....	Webster	....
Robertson	100	Hardin	....
Robins	50	Linn	....
Robinson	.....	Delaware	....
Rochester	.....	Cedar	....
Rockaway	.....	Jackson	....
Rockbranch	75	Woodbury	....
Rock Creek	.....	Clinton	....
Rockcreek	.....	Mitchell	....
Rockdale Mills	150	Dubuque	....
Rock Falls	87	Cerro Gordo	....
Rockford	916	Floyd	*
Rock Rapids	2005	Lyon	**
Rockton	.....	Marshall	....
Rock Valley	1198	Sioux	*
Rockwell	700	Cerro Gordo	*
Rockwell City	1528	Calhoun	***
Rode	.....	Harrison	....
Rodman	131	Palo Alto	....
Rodney	163	Monona	....
Roelyn	.....	Webster	....
Rogers	.....	Linn	....
Rogersville	.	Benton	....
Roland	641	Story	*
Rolfe	954	Pocahontas	*
Rome	155	Henry	....
Roots Siding	.....	Butler	....
Rorbeck	.....	Shelby	....
Roscoe	50	Des Moines	....
Rosebrook	.....	Monroe	....
Rose Hill	269	Mahaska	....
Roselle	100	Carroll	....
Rosendale	40	Boone	....
Roseville	.....	Floyd	....
Ross	125	Audubon	....
Rossie	200	Clay	....
Rossville	.....	Allamakee	....
Rossville Station	.....	Allamakee	....
Roundgrove	.....	Scott	....
Rousseau	.....	Marion	....
Rowan	256	Wright	....
Rowley	350	Buchanan	....
Royal	400	Clay	....
Rubens	.....	Pocahontas	....
Rubio	200	Washington	....
Rudd	296	Floyd	....
Runnels	428	Polk	....
Rusk	.....	Pocahontas	....
Russell	612	Lucas	....
Rust	.....	Bremer	....
Ruthven	655	Palo Alto	*
Rutland	212	Humboldt	....
Rutledge	75	Wapello	....
Ryan	511	Delaware	*
Sabula	918	Jackson	*
Sac City	2201	Sac	**
Safeside	.....	Guthrie	....
Sageville	75	Dubuque	....
Salem	501	Henry	....
Salina	475	Jefferson	....
Salix	390	Woodbury	....
Samoa	.....	Jackson	....
Sanborn	1174	O'Brien	*
Sand Prairie	....	Lee	....
Sandspring	213	Delaware	....
Sandusky	56	Lee	....
Sandyville	120	Warren	....
Santiago	36	Polk	....
Saratoga	75	Howard	....
Sattre	.....	Winneshiek	....
Saude	18	Chickasaw	....
Savannah	76	Davis	....
Sawyer	30	Lee	....
Saxon	.....	Wayne	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Saylor	.....	Polk	....
Scandia	.....	Boone	....
Scarville	129	Winnebago	....
Schaller	646	Sac	***
Schee	.....	Van Buren	....
Schleswig	455	Crawford	*
Schley	75	Howard	....
Schrunks	.....	Clayton	....
Sciola	.	Montgomery	....
Scotch Grove	100	Jones	....
Scott	20	Fayette	....
Scranton	845	Greene	*
Seargeant Bluff	525	Woodbury	....
Searsboro	226	Poweshiek	....
Secor	.....	Hardin	....
Seevers	.....	Jasper	....
Seigel	27	Bremer	....
Selection	.....	Monroe	....
Selma	250	Van Buren	....
Seneca	47	Kossuth	....
Seney	150	Plymouth	....
Seven Mile	.....	Cass	....
Sewal	275	Wayne	....
Sexton	200	Kossuth	....
Seymour	2,290	Wayne	*
Shadygrove	....	Buchanan	....
Shady Oak	.....	Webster	....
Shaffton	.....	Clinton	....
Shambaugh	245	Page	....
Shannon City	292	Union	....
Sharon	.....	Appanoose	....
Sharon Center	70	Johnson	....
Sharpsburg	181	Taylor	....
Sheffield	824	Franklin	***
Shelby	586	Shelby	....
Sheldahl	202	Polk	....
Sheldon	2941	O'Brien	***
Shellrock	741	Butler	**
Shellsburg	527	Benton	*
Shenandoah	4976	Page	**
Shepard	.....	Union	....
Sheridan	25	Poweshiek	....
Sherman	.....	Hardin	....
Sherrill	200	Dubuque	....
Sherwood	100	Calhoun	....
Shipley	.....	Story	....
Shoecraft	.....	Jackson	....
Shopton	.....	Lee	....
Shueyville	100	Johnson	....
Siam	150	Taylor	....
Sibley	1330	Osceola	***
Sidney	1019	Fremont	*
Sigourney	2032	Keokuk	***
Silver City	416	Mills	....
Silver Creek	.....	Delaware	....
Silverlake	.....	Worth	....
Sinclair	.	Butler	....
Sioux Center	1064	Sioux	*
Sioux City	47828	Woodbury	**
Sioux Rapids	868	Buena Vista	**
Slater	473	Story	*
Slifer	.....	Webster	....
Sloan	547	Woodbury	*
Smith Lake	.....	Cass	....
Smithland	334	Woodbury	*
Smith	.....	Jackson	....
Smith Siding	.....	Monona	....
Syrna	.....	Clarke	....
Smefs	.....	Clayton	....
Sny Magill	.....	Clayton	....
Solberg	.....	Wright	....
Soldier	167	Monona	....
Solomon	.....	Mills	....
Solon	450	Johnson	*
Somber	.....	Worth	....
Somers	169	Calhoun	....
Somers	.....	Webster	....
Sonora	.....	Poweshiek	....
South Amana	248	Iowa	....
South English	338	Keokuk	....
South River	.....	Warren	....
Spaulding	100	Union	....
Spechts Ferry	.....	Dubuque	....
Spencer	3005	Clay	**
Sperry	65	Des Moines	....
Spillville	320	Winneshiek	....
Spirit Lake	1162	Dickinson	***
Spragueville	100	Jackson	....
Springbrook	217	Jackson	....
Spring Creek	.....	Mahaska	....
Springdale	125	Cedar	....
Springdale	.....	Woodbury	....
Spring Fountain	.....	Bremer	....
Spring Grove	.....	Des Moines	....
Spring Hill	94	Warren	....
Springvalley	.....	Decatur	....
Springville	588	Linn	*
St. Ansgar	747	Mitchell	*
St. Anthony	199	Marshall	....
St. Benedict	100	Kossuth	....
St. Charles	399	Madison	....
St. Donatus	150	Jackson	....
St. Joseph	100	Kossuth	....
St. Lucas	138	Fayette	....
St. Mary's	.....	Warren	....
St. Olaf	170	Clayton	....
St. Paul	62	Lee	....
St. Sebald	.....	Clayton	....
Stacyville	407	Mitchell	....
Stacyville Jct.	.....	Mitchell	....
Stanhope	281	Hamilton	....
Stanley	700	Buchanan	....
Stanton	653	Montgomery	*
Stanwood	511	Cedar	*
Stark	.....	Mahaska	....
State Center	898	Marshall	*
Steamboat Rock	378	Hardin	....
Stennett	125	Montgomery	
Sterling	125	Jackson	
Steuben	.....	Davis	....
Stiles	110	Davis	....
Stillson	95	Hancock	....
Stillwell	25	Poweshiek	....
Stockport	265	Van Buren	....
Stockton	138	Muscatine	....
Stone City	700	Jones	....
Storm Lake	2428	Buena Vista	***
Story City	1387	Story	*
Stout	175	Grundy	....
Strahan	50	Mills	....
Strand	15	Adams	....
Stratford	554	Hamilton	*
Strawberry Point	1052	Clayton	*
Struble	327	Plymouth	....
Stuart	1826	Guthrie	*
Sudbury	.....	Muscatine	....
Sugar Creek	.....	Lee	....
Sully	232	Jasper	*
Sulphur Springs	100	Buena Vista	....
Summerset	150	Warren	....
Summertset Jct.	.....	Warren	....
Summit	.....	Fremont	....
Summit	.....	Guthrie	....
Summit	.....	Lee	....
Summit	.....	Muscatine	....
Summitville	100	Lee	....
Summer	1404	Bremer	***
Sunbury	200	Cedar	....
Superior	154	Dickinson	....
Sutherland	664	O'Brien	***
Sutton	.....	Warren	....
Swaledale	235	Cerro Gordo	....
Swan	292	Marion	....
Swanlake	.....	Emmet	....
Swanton	75	Butler	....
Swea City	402	Kossuth	*
Swedesburg	100	Henry	....
Sweetland	25	Muscatine	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Swisher	.....	Johnson	....
Sylvia	.....	Linn	....
Tabor	909	Fremont	*
Taintor	150	Mahaska	....
Talleyrand	96	Keokuk	....
Talmage	125	Union	....
Tama	2290	Tama	**
Tara	150	Webster	....
Taylor	75	Pottawattamie	....
Teeds Grove	75	Clinton	....
Temple Hill	12	Jones	....
Templeton	278	Carroll	*
Tennant	200	Shelby	....
Tenold	50	Worth	....
Terril	253	Dickinson	....
Thayer	198	Union	....
Thompson	500	Winnebago	***
Thor	271	Humboldt	....
Thornburg	233	Keokuk	....
Thornton	271	Cerro Gordo	....
Thorpe	71	Delaware	....
Thrall	31	Wright	....
Therman	336	Fremont	....
Ticonic	200	Monona	....
Tiffin	176	Johnson	....
Tileville	.....	Madison	....
Tilton	50	Poweshiek	....
Tingley	380	Ringgold	....
Tioga	40	Mahaska	....
Tipton	2048	Cedar	....
Titonka	278	Kossuth	***
Titus	.....	Washington	....
Tivoli	25	Dubuque	....
Toddville	55	Linn	....
Toeterville	100	Mitchell	....
Togo	.....	Decatur	....
Toledo	1626	Tama	***
Toolsboro	110	Louisa	....
Toronto	106	Clinton	....
Tracy	300	Marion	....
Traer	1283	Tama	***
Trask	.....	Appanoose	....
Trenton	75	Henry	....
Treynor	122	Pottawattamie	....
Tripoli	755	Bremer	*
Troy	200	Davis	....
Troy	.....	Lucas	....
Troy Mills	350	Linn	....
Truesdale	200	Buena Vista	....
Truro	310	Madison	....
Turin	154	Monona	....
Turkey River	50	Clayton	....
Turkey River Jct.	.....	Clayton	....
Turner	27	Jasper	....
Turners	.....	Linn	....
Turnout	.....	Scott	....
Tuskega	30	Decatur	....
Tweton	.....	Winnebago	....
Tyner	.....	Polk	....
Tyrell	.....	Wright	....
Tyrone	50	Monroe	....
Udell	186	Appanoose	....
Ulmer	125	Sac	....
Underwood	271	Pottawattamie	*
Union	540	Hardin	*
Union Mills	50	Mahaska	....
Unionville	500	Appanoose	....
Unique	.....	Humboldt	....
Unity	.....	Johnson	....
University Park	500	Mahaska	....

Updegraf	.....	Clayton	....
Upton	.....	Van Buren	....
Urbana	306	Benton	....
Ute	490	Monona	*
Utica	35	Van Buren	....
Vail	631	Crawford	*
Valdora	.....	Clayton	....
Valeria	250	Jasper	....
Valley	25	Washington	....
Valley Junction	2573	Polk	***
Vancleve	75	Marshall	....
Vandalia	100	Jasper	....
Van Horn	444	Benton	....
Van Meter	386	Dallas	....
Van Wert	461	Decatur	....
Varina	183	Pocahontas	....
Ventura	400	Cerro Gordo	....
Veo	15	Jefferson	....
Verde	.....	Decatur	....
Verdi	26	Washington	....
Vernon	249	Van Buren	....
Victor	640	Iowa	*
Victoria	.....	Bremer	....
Viele	35	Lee	....
Village Creek	178	Allamakee	....
Villisca	2039	Montgomery	**
Vilmar	35	Butler	....
Vincennes	110	Lee	....
Vincent	215	Webster	....
Vining	250	Tama	....
Vinje	23	Winnebago	....
Vinton	3336	Benton	**
Viola	180	Linn	....
Viola Center	65	Audubon	....
Vista	25	Buchanan	....
Volga	416	Clayton	....
Volney	99	Allamakee	....
Voorhies	200	Black Hawk	....
Wadena	253	Fayette	....
Walcott	416	Scott	***
Wald	.....	Cedar	....
Wales	27	Montgomery	....
Walford	150	Benton	....
Walker	517	Linn	*
Wallace	24	Dickinson	....
Wallin	.....	Montgomery	....
Wallingford	300	Emmet	....
Wall Lake	561	Sac	*
Wall Lake Sta.	.....	Sac	....
Walnut	950	Pottawattamie	*
Walnut City	30	Appanoose	....
Wanamaker	.....	Ringgold	....
Waneta	12	Davis	....
Wapello	1326	Louisa	**
Wapsie	25	Bremer	....
Ward	75	Monroe	....
Ware	175	Pocahontas	....
Warren	.....	Lee	....
Warsaw	.....	Wayne	....
Washburn	125	Black Hawk	....
Washington	4380	Washington	**
Washington Mills	.....	Dubuque	....
Washington Prairie	20	Winneshiek	....
Washta	410	Cherokee	....
Waterloo	26693	Black Hawk	**
Waterville	300	Allamakee	....
Watkins	225	Benton	....
Watson	75	Cayton	....
Watterson	25	Ringgold	....
Waubeek	150	Linn	....
Waucoma	433	Fayette	....
Waukee	340	Dallas	....
Waukon	2025	Allamakee	***
Waukon Jct.	75	Bremer	....
Waupeton	50	Bremer	....
Waverly	3205	Dubuque	....
Waverly Jct.	80	Bremer	....
Wayland	550	Henry	....
Wayland Crossing	.....	Washington	....
Wayne	25	Henry	....
Webb	150	Clay	....
Webster	127	Keokuk	....
Webster City	5208	Hamilton	**
Weldon	308	Decatur	....
Weller	37	Monroe	....
Wellman	724	Washington	**
Wellsburg	288	Grundy	....
Welton	69	Clinton	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

Showing Installation of Water Works, Sewers and Sewage Disposal.—Continued.

Name of City, Town, Village	Population Census 1910	County	See Note Expl. ***
Wescott	.....	Lee	....
Wesley	457	Kossuth	*
West	200	Iowa	....
West Bend	679	Palo Alto	*
West Branch	643	Cedar	**
West Burlington	1206	Des Moines	....
West Chester	222	Washington	....
Western College	220	Linn	....
Westerville	65	Decatur	....
Westfield	143	Plymouth	....
Westgate	232	Fayette	....
West Grove	175	Davis	....
West Keithsburg	.....	Louisa	....
West Liberty	1666	Muscatine	***
West Mitchell	126	Mitchell	....
West Okoboji	.....	Dickinson	....
Weston	109	Pottawattamie	....
Westphalia	200	Shelby	....
West Point	570	Lee	....
West Rapids	.....	Linn	....
West Side	367	Crawford	*
West Union	1652	Fayette	***
Wever	200	Lee	....
What Cheer	1720	Keokuk	*
Wheatland	539	Clinton	*
Wheeler	35	Pottawattamie	....
Wheelerword	41	Cerro Gordo	....
Whitebreast	.....	Lucas	....
White City	100	Mahaska	....
White Cloud	27	Mills	....
White Elm	.....	Davis	....
Whiteoak	33	Mahaska	....
White Pigeon	25	Keokuk	....
Whitesboro	.....	Harrison	....
White Sulphur	250	Scott	....
Whiting	576	Monona	....
Whittemore	518	Kossuth	*
Whitten	219	Hardin	....
Whittier	100	Linn	....
Wichita	46	Guthrie	....
Wick	75	Warren	....
Wightman	.....	Calhoun	....
Wilke	.....	Hardin	....
Wilkins	.....	Dubuque	....
Willard	.....	Wapello	....
Willett	.....	Harrison	....
Wiley	75	Carroll	....
Williams	457	Hamilton	*
Williamsburg	1060	Iowa	*
Williamson	10	Adams	....
Williamstown	45	Chicksaw	....
Willit	.....	Van Buren	....
Willowcreek	.....	Clay	....
Wilson	.....	Clay	....
Wilson	.....	Jasper	....
Wilsonville	.....	Van Buren	....
Wilton	1157	Muscatine	*
Winchester	.....	Van Buren	....
Windham	35	Johnson	....
Winfield	934	Henry	*
Winkelmans	.....	Greene	....
Winslow	30	Black Hawk	....
Winterset	2818	Madison	*
Winthrop	529	Buchanan	*
Wiota	239	Cass	....
Wise	.....	Buchanan	....
Woden	162	Hancock	....
Wolfe	.....	Boone	....
Wood	50	Clayton	....
Woodbine	1538	Harrison	*
Woodburn	420	Clarke	....
Woodland	.75	Decatur	....
Woodward	712	Dallas	*
Woolson	24	Jefferson	....
Woolstock	264	Wright	....
Worthington	314	Dubuque	....
Wren	.....	Plymouth	....
Wright	100	Mahaska	....
Wyman	100	Louisa	....
Wyoming	733	Jones	*
Yaggy	.....	Warren	....
Yale	273	Guthrie	....
Yampa	.....	Wapello	....
Yankee	.....	Clay	....
Yarmouth	200	Des Moines	....
Yellow River	.....	Allamakee	....
Yeomans	.....	Plymouth	....
Yetter	107	Calhoun	....
Yoder	.....	Polk	....
York Center	.....	Iowa	....
Yorkshire	75	Harrison	....
Yorktown	228	Page	....
Young	.....	Johnson	....
Zacharys	.....	Jasper	....
Zaneta	.....	Grundy	....
Zearing	461	Story	....
Zenersville	.....	Boone	....
Zero	.....	Lucas	....
Zwingle	69	Jackson	....

***Note:—Water Works indicated thus *; Water Works and Sewers indicated thus **; Water Works, Sewers and Sewage Disposal indicated thus ***

From the above list as compiled, the following summary may be made:

Total number of cities, towns and villages	2278
Number of cities and towns having installed water works	445
Number of cities and towns having installed water works and sewers	156
Number of cities and towns that have installed sewage disposal	58

One purpose in compiling the above list is to obtain as complete a list as possible of all of the centers of population in the state where more than a few persons, or more than one family of persons live. It may be true that a few such centers of population have been overlooked in this compilation. It may also be true that a few of the places listed have no population or not more than a single family. Several of the places mentioned are old towns in their decay. A number of the towns mentioned are new places that are destined to have considerable growth. We may assume that if the places having so little population as to be of little concern were dropped from the list, there would still remain about 2,000 cities, towns and villages that either have water-works, sewers and sewage disposal, or will need and desire such installations in the immediate future.

The list as compiled indicates that about one in five of the cities, towns and villages have made any sanitary installations what so ever, that only about one in thirteen of the number have installed any kind of sewer system, and that about one in thirty-four of the number have installed sewage disposal plants. Of the entire number of cities, towns and villages in the state, not a single one has installed a complete up-to-date garbage disposal plant, although a number of cities have used and maintained a system of garbage collection with imperfect methods of disposal. It is expected however, that a few of the larger cities will install garbage disposal plants within the next year or two. As it now stands, the garbage disposal problem in Iowa is yet unsolved.

It is unfortunate for our present purpose that we cannot assign a population to 633 of the centers of population listed. Where a population is given in the list, such population is taken from the census of 1910, in which 828 cities and towns were listed, and also taken from Rand & McNally's Pocket Map and Shipper's Guide in which a population of 874 additional towns and villages is given, and 43 villages were added from other sources making a total number of 1,645.

Of the 633 towns with no population listed, there doubtless will be found a considerable number having a population of 100 or more. It will be understood that the difficulty of obtaining the population of the cities, towns and villages of the state lies in the fact that the census of 1910, gave the population of incorporated cities and towns only, and the population of all other centers of population was included in the census of the townships in which such unincorporated centers of population are located. It will perhaps not be difficult to complete a list after it has been published in the form above given.

At the present time the tendency to modern sanitary installations in the home is so great that the residence becomes the unit, rather than the town or city. It is therefore true that any center of population comprising two or more residences may desire a water supply and a means of sewage disposal. Except in isolated locations residential disposal plants are not to be recommended, and in all centers of population, no matter how small, the economic plan is the common disposal plant. An examination of the list will reveal the fact that there are many towns in Iowa large enough that such towns should have made all necessary sanitary installations several years ago. Of the installations made in the past year, nearly all have been in towns ranging from 200 to 1,500 population. The smaller towns seem to be more eager for sanitary installations than many of the larger towns. This tendency indicates that in the very near future practically all of the centers of population will be supplied with the necessary sanitary requirements.

The following classification of the cities, towns and villages of Iowa above listed, according to population listed, will be found a convenient classification with reference to sanitary installations at the present time.

Total number of cities, towns and villages listed	2278
Listed towns and villages with no population given	633
Listed cities, towns and villages with population given	1645
Towns and villages having a listed population up to 100	486
Towns and villages having a listed population 100-500	742
Towns and villages having a listed population 500-1100	216
Cities, towns and villages having a listed population 1100 and over	171
Total	1645
Cities and towns having waterworks only (1)	289
Cities and towns having waterworks and sewers only (2)	98
Cities and towns having waterworks, sewers and sewage disposal (3)	58
Total number of waterworks installations—(sum of 1-2-3)	445
Total number of sewer installations—(sum of 2-3)	156
Total number of sewage disposal plants	58
Cities and towns of 1100 population and over having waterworks	170
Cities and towns 500-1100 population having waterworks	172
Cities and towns less than 500 population having waterworks	103
Total	445
Cities and towns of 1100 population and over having sewers	126
Cities and towns of 500-1100 population having sewers	27
Cities and towns of less than 500 population having sewers	3
Total	156
Cities and towns of 1100 population and over having sewage disposal	47
Towns of 500-1100 population having sewage disposal	9
Towns of less than 500 population having sewage disposal	2
Total	58

Smallest town having waterworks has a population of..... 102
Smallest town having waterworks and sewers has population of..... 357
Smallest town having waterworks, sewer and sewage disposal has population of 416

For the information of municipal officials, civil and sanitary engineers, and others interested in sanitary installations, RULE NINE, under the provisions of which the state board of health and its authorized representatives have been supervising water supplies, sewer installations, sewage treatment plants and garbage disposal plants, is herein published.

This rule was first adopted at the November, 1913, meeting of the board, and is here given as revised at a later meeting of the board.

IOWA STATE BOARD OF HEALTH—RULE NINE.

Whereas, Section 2565 of the Code and Chapter 207, Laws of the 35th General Assembly, provide that the Iowa State Board of Health shall have charge of and general supervision over the interests of the health and life of the citizens of the State, and confers upon the Board the 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, and

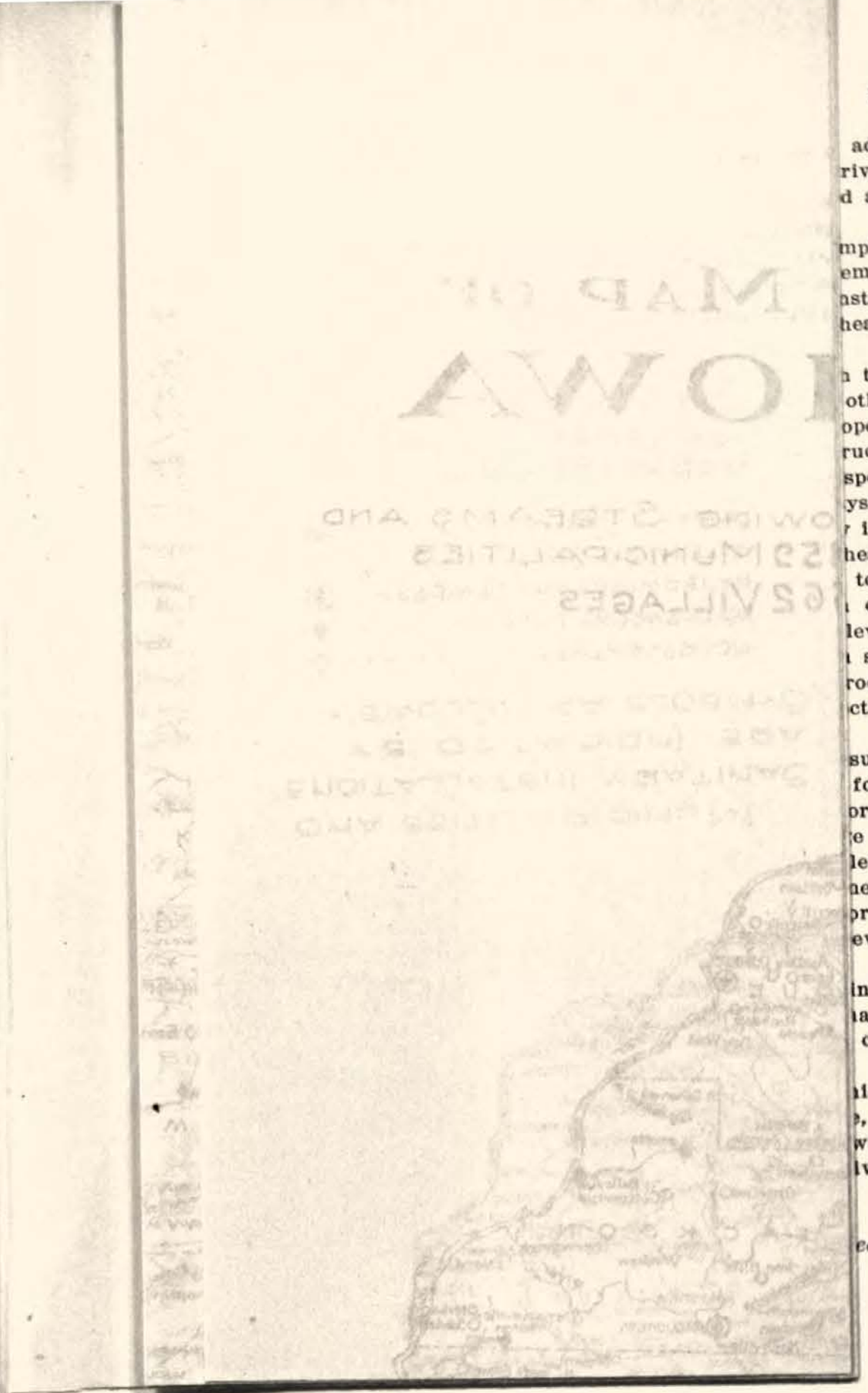
Whereas, many cities and towns of Iowa through improper location and administration of public water supplies and imperfect installation of sewer systems and sewage and garbage disposal plants are endangering the health and life of their citizens and the public at large, and

Whereas, many cities and towns of Iowa through lack of proper public water supplies and properly constructed sewer systems and garbage disposal plants have produced unhealthy conditions endangering the health and life of their citizens and the public at large, which unhealthy conditions have been the cause of epidemics of typhoid fever and other contagious diseases; Therefore, Be It

Resolved, that the following rule be adopted by this Board *providing for* the supervision of all public water supplies and sewage and garbage disposal systems, and now installed or hereafter to be installed in the State of Iowa, to be known as Rule 9, Chapter IV, of the Revised Rules and Regulations of the State Board of Health.

RULE IX. Section 1. It is hereby ordered by the State Board of Health that any city, village or public institution in the State of Iowa or private corporation, which contemplates the construction or extension or modification of a public water supply system, or the construction or extension of a sewer system or sewage disposal or purification works, or garbage disposal plant, shall file with the State Board of Health the plans and specifications of such contemplated work for their approval, and the State Board of Health shall approve such plans and specifications if found satisfactory, and if the plans are not found satisfactory and sufficient to safeguard the health and life of the citizens of the state, the

addi-
rivate
d and
mplat-
em or
nstitu-
health
h that
other-
operly
ructed
sposal
ystem
r indi-
health
to be
city,
leviat-
such
roceed
ctions
super-
found
or its
e and
led in
nenda-
proper
ewage
in the
lay be
carry
nicipal
, and
works,
ive in
eer.



wn having
wn having v
own having
tion of ....

informatio
interested
which the
been sup
plants and
le was fir
is here gi

IOWA

, Section
ssembly,
e of and
f the cit
o make s
time to
of the
ds of H
, many
tion of
ems an
and lif
, many
olies ar
ts have
their
ve bee
eases;
, that
ision
ms, a
e kn
s of
X.
t an
cor
atio
of a
ispo
spe
tate
nd satisfactory, and if the plans are not
o safeguard the health and life of the citizens of the state, the

State Board of Health shall set forth the necessary alterations or additional requirements, which must be met by such city, village, private corporation or public institution before the plans shall be approved and the contemplated work allowed to be constructed.

SEC. 2. Any private institution, or business, or corporation, contemplating the construction or extension of a water supply, or sewer system or sewage or garbage disposal plant in the State of Iowa, where such institution is in vital touch with the public, and liable to affect the public health shall conform to the requirements of section one (1) of this rule.

SEC. 3. It is further ordered by the Iowa State Board of Health that whenever it shall receive knowledge through its own inspection or otherwise, that any city, town or township in Iowa either through improperly located and administered public water supplies, or improperly constructed sewer systems, or imperfect installations of sewage and garbage disposal plants, or through a carelessly operated and controlled privy system which contaminates the domestic water supply, whether supplied by individual wells, public wells or other sources, is endangering the health and life of the citizens of the State it shall at once make or cause to be made a complete investigation of the conditions existing in such city, town or township, and shall determine a method of procedure for alleviating or abating the unhealthful or dangerous conditions existing in such city, town or township, and the Local Board of Health shall proceed without unnecessary delay to carry out the regulations and directions of the State Board of Health.

SEC. 4. It is also ordered by the State Board of Health that such supervision, either direct or as may be otherwise provided, as may be found necessary shall be maintained by the State Board of Health or its authorized representatives over all systems of water supply, sewage and garbage disposal that are now installed or will be hereafter installed in any city, town or locality in the State of Iowa, and that all recommendations resulting from such supervision shall be carried out by the proper parties in charge of the administration of such water supplies and sewage and garbage disposal systems.

SEC. 5. It shall be the duty of every Local Board of Health in the State of Iowa to adopt Rule 9 in its entirety or in such form as may be necessary to apply to the conditions incident to its locality, and to carry out its provisions in the manner above stated.

The operation of this rule has been highly successful. Municipal officials have appreciated the assistance rendered under the rule, and the engineers interested in the design and installation of waterworks, sewers, sewage and garbage disposal in Iowa have been responsive in their co-operation with the State Board of Health.

(Signed) LAFAYETTE HIGGINS,
Civil and Sanitary Engineer.

INDEX

SIXTEENTH BIENNIAL REPORT

OF THE

Bureau of Labor Statistics

FOR THE

Errata

Page 12—Sixth line under "Recommendations," "two provisions" should be "no provisions".

Page 187—Farm labor, 1910, Adair, winter month should be $22.92 instead of $29.92.

A. L. URICK, Commissioner

DES MOINES
ROBERT HENDERSON, STATE PRINTER
1914

SIXTEENTH BIENNIAL REPORT

OF THE

Bureau of Labor Statistics

FOR THE

STATE OF IOWA

For the Biennial Period 1912-1913

A. L. URICK, Commissioner

DES MOINES
ROBERT HENDERSON, STATE PRINTER
1914