STATE OF IOWA

1916

REPORT OF THE

STATE BOARD OF HEALTH

FOR THE

Biennial Period Ending June 30, 1916

GUILFORD H. SUMNER, M. D.
SECRETARY

Published By
THE STATE OF IOWA
Des Moines

LETTER OF TRANSMITTAL.

Hon. 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 eighteenth biennial report of the State Board of Health for the period commencing July 1, 1914, and ending June 30, 1916.

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

Des Moines, October 31, 1916.

IOWA STATE BOARD OF HEALTH

MEMBERS OF THE BOARD.

Hon. G. W. Clarke, Governor ..... Adel
Hon. W. S. Allen, Secretary of State ..... Fairfield
Hon. F. S. Shaw, Auditor of State ..... Tama
Hon. W. C. Brown, Treasurer of State ..... Clarion
Dr. W. L. Bierring, (R) President, term expires June 30, 1919 ..... Des Moines
Dr. H. A. Dittmer, (H) Vice President, term expires June 30, 1917 ... Manchester
Dr. G. F. Severs, (E) term expires June 30, 1920 ..... Centerville
Dr. J. L. Tamisiea, (R) term expires June 30, 1916 ..... Missouri Valley
Prof. Lafayette Higgins, (C. E.) term expires June 30, 1918 .... Des Moines
Dr. Guilford H. Sumner, Secretary ..... Des Moines

STATE EXAMINATION OF PHYSICIANS.

Dr. Walter L. Bierring, President ..... Des Moines
Dr. Guilford H. Sumner, Secretary and Treasurer ..... Des Moines
Physicians of the State Board of Health constitute the State Board of Medical Examiners.

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

LABORATORIES FOR STATE BOARD OF HEALTH.

Dr. Henry Albert, Director ..... Iowa City
Dr. Mark F. Boyd, Epidemiologist ..... Iowa City
Dr. Chester Demaree, Diagnostic Bacteriologist ..... Iowa City
Mr. Jack J. Hinman, Water Chemist and Bacteriologist ..... Iowa City

STATE REGISTRATION OF VITAL STATISTICS.

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

LEGAL DEPARTMENT.

George Cosson, Attorney General ..... Des Moines
John Fletcher, Assistant Attorney General ..... Des Moines
C. A. Robbins, Assistant Attorney General ..... Des Moines
Wiley S. Rankin, Special Counsel ..... Des Moines
Henry E. Sampson, Special Counsel ..... Des Moines

INSPECTION OF LODGING HOUSES AND HOTELS.

Norval Enger, (C. E.) Hotel Inspector ..... Des Moines
O. A. Schow, Chief Deputy ..... Des Moines
H. K. Horning, Deputy ..... Des Moines

REPORT STATE BOARD OF HEALTH

The Iowa State Board of Health was established by law with offices at the seat of the state government in 1880, and from time to time changes in the law and addition of duties and responsibilities have been made, until the activities of the board and its allied departments are embraced under the following ten heads:

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.

The Code of Iowa provides, Sec. 2565 as follows regarding the authority of the State Board of Health and specific duties:

"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 instructions 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."

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.

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.

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 marriages, divorces and births.

The law requires this work to be done by the Secretary Registrar, who receives no salary for this work. 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. These should be provided for by an appropriation made by the Legislature.

Sanitary inspection is an important part to be performed in the Sanitary Engineering Department; and investigations are made from time to time as is required.

Hotel inspection is carried on by three inspectors, and all hotels are inspected annually.

The divisions of examinations are carried on under the heads of physicians, embalmers, nurses and optometrists. Many examinations are held during the year in these various departments.

The Antitoxin department furnishes antitoxins and vaccines to the people of Iowa and the State Institutions at cost, thus saving the people of the state thousands of dollars annually, as well as the saving of many lives.

The bacteriological department performs the duties of making diagnoses of diseases, performing many examinations of specimens sent to the laboratory and making analyses of water when necessary.

The State Board of Health has many duties to perform in supervising the work in all the above named departments. The most important work of the State Board is to formulate rules and regulations for the guidance of local boards and the people in general.

EMBALMERS' DEPARTMENT.

At the end of the biennial period, June 30, 1916, there were 1,293 licensed embalmers in good standing with the Iowa State Board of Health.

During the biennial period, July 1, 1914, to June 30, 1916, there were 125 embalmers' licenses issued upon examination and 21 by reciprocity, making a total of 146.

Iowa has reciprocity with the following states upon the basis of an examination only: Illinois, Idaho, Colorado, Nebraska, Wisconsin.

During the biennial period ending June 30, 1916, disinterment permits were issued as follows:

	1914-1915		1915-1916
July	89	July	77
August	57	August	70
September	124	September	109
October	123	October	137
November	107	November	165
December	47	December	41
January	21	January	40
February	23	February	15
March	63	March	47
April	139	April	136
May	122	May	112
June	81	June	69
Total	1,004	Total	1,022

Special disinterment permits issued, 126.

Total number of disinterment permits issued, 2,152.

NURSES' DEPARTMENT.

At the end of the biennial period, June 30, 1916, there were 2,143 nurses registered in Iowa. Of this number, 576 were granted certificates during the last biennial period.

Since January 1, 1910, all nurses who had applied for registration were required to pass an examination, as the time for registration without examination, as fixed by law, expired January 1, 1910. Of the 576 certificates issued during the last biennial period, 12 were issued by reciprocity from other states.

Iowa has reciprocity with the following states, upon the basis of an examination only: Illinois, Indiana, Wisconsin, Michigan, Colorado, Minnesota and Pennsylvania.

BOARD OF MEDICAL EXAMINERS.

Total number of physicians registered and practicing in this state June 30, 1916.....3,751

Ratio 1 to every 600.

Number of certificates issued during biennial period	260
Number of certificates issued upon examination	165
Number of certificates issued under reciprocal agreements with other states	95
Number of itinerants' licenses issued during biennial period	16
Number of Osteopathic certificates issued	61

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, 1916, there were 715 optometrists registered in Iowa. Of this number 45 were granted certificates during the last biennial period.

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	547
Total number of certificates issued upon examination	168
Total number of certificates in force June 30, 1916	715

THE ANTITOXIN DEPARTMENT.

The people of the state of Iowa saved $53,178 in the last two years, through distribution of diphtheria antitoxin by the State Board of Health. During the biennial period 14,732 packages of diphtheria antitoxin were used in this state. The market price of this antitoxin was $76,534. At the price the State Board of Health secured the material and distributed it, the consumers paid only $23,356 for it.

The following shows the extent of operations of the antitoxin department, as administered through 300 stations, in the five-year period, since it was organized, from July 4, 1911, to June 30, 1916:

Number of packages used in five years	27,105
Cost if furnished at regular prices	$130,135.50
Amount actually paid for same by people of state	39,428.95
Amount saved to people who used Iowa State Board of Health Antitoxin	90,706.55

The benefits to the state in the way of lessening the severity of diphtheria cannot be measured. No estimate of the number of lives saved by having a supply of antitoxin in practically every neighborhood in the state, can be made. When the old commercial prices prevailed, many druggists refused to handle antitoxin. As a result many children ill with diphtheria died before a supply of antitoxin could be shipped out from Des Moines.

The State Board of Health has made a new contract for diphtheria antitoxin, under which the prices to the consumer will be reduced. The commercial price of the 1,000-unit package is $2. The price of this package sold under the State Board of Health contract in the last two years was 60 cents. During the next two years the price will be 50 cents a package. The 5,000-unit package retails at $7.50. The board of health has been selling it at $2.25. The new price will be $1.80. The 10,000-unit package, retailing at $12, has been sold by the board of health at $4 in the last two years. The new price will be $3.35.

The board of health has stations for the sale of antitoxin at all important centers in the state. The number of stations has been 250. By January 1st, 1917, the number will be increased to 300. The new prices will be in effect beginning the first of the year. The stations will sell diphtheria, antitoxin, tetanus antitoxin, typhoid vaccine and smallpox vaccine, under state contract. There

will be a reduction in the price of all antitoxins and vaccines under the new contract.

But few people know that the cost of rendering a person immune to typhoid fever is 28 cents. The typhoid vaccine can be purchased through the state board of health stations at that price.

FINANCIAL STATEMENT FOR THE BIENNIUM.

STATE BOARD OF HEALTH.

Appropriation by the state		$ 16,900.00
Salaries	$ 11,997.50	
Expenses special investigations	1,113.01	
Other official expenses	557.77	
Miscellaneous—printing, postage, etc.	2,090.82	
		15,759.10
Balance		$ 1,140.90

BOARD OF MEDICAL EXAMINERS.

Fees collected and paid treasury		$ 7,607.00
Salaries	$ 600.00	
Other official expenses	379.08	
Prior expenses paid this biennium	321.67	
Miscellaneous expenditures	898.77	
		2,199.52
Balance		$ 5,407.48

ANTITOXIN DEPARTMENT.

Appropriation by the state		$ 4,000.00
Salaries	$ 1,627.46	
Miscellaneous	825.38	
		2,452.84
Balance		$ 1,547.16

VITAL STATISTICS.

Appropriation by the state	$ 4,900.00	
Fees collected and paid treasury	213.15	
		$ 5,113.15
Salaries	$ 3,147.50	
Miscellaneous expenses	1,752.50	
		4,900.00
Balance		$ 213.15

EMBALMERS' DEPARTMENT.

Fees collected and paid treasury		$ 3,617.00
Salaries	$ 600.00	
Other official expenses	549.08	
Miscellaneous expenditures	1,442.78	
		2,591.86
Balance		$ 1,025.14

NURSES' DEPARTMENT.

Balance from previous biennium	$ 971.82	
Fees collected and paid treasury	3,286.00	
		$ 4,257.82
Official expenditures	$ 1,981.89	
Miscellaneous	1,280.05	
		3,261.94
Balance on hand to be carried forward		$ 995.88

OPTOMETRY DEPARTMENT.

Balance from previous biennium	$ 17.01	
Fees collected and paid treasury	735.00	
		$ 752.01
Pier diem of board members	$ 222.50	
Other official expenditures	111.08	
Miscellaneous	58.51	
		392.09
Balance on hand		$ 359.92

HOTEL INSPECTION DEPARTMENT.

Balance from previous biennium	$ 356.15	
Fees for inspection 3,111 hotels	14,874.50	
		$ 15,230.65
Salaries	$ 4,440.00	
Per diem and expenses of deputies	10,076.87	
Miscellaneous expenditures	348.75	
		14,865.62
Balance on hand		$ 365.03

SUMMARY.

Total of state appropriations	$ 25,800.00	
Fees and balances	31,677.63	
		$ 57,477.63
Total salaries all departments	$ 22,412.46	
Per diem and expenses	15,024.27	
Postage and express	2,169.05	
Printing, engraving, etc.	2,473.72	
Miscellaneous expenditures	4,343.47	
		46,422.97
Balances unused		$ 11,054.66

TABLE NO. 1. QUARANTINABLE DISEASES IN IOWA.

Number Reported for Iowa, by Months, for Biennial Period Ending June 30, 1916.

	Scarlet fever	Diphtheria	Smallpox	Cerebrospinal meningitis	Anterior polomyelitis	Total
1914—						
July	21	36	76	2	----	135
August	23	31	10	1	----	65
September	41	35	44	----	4	124
October	83	138	61	2	6	290
November	67	153	169	2	1	392
December	102	131	208	2	----	443
1915—						
January	125	97	261	3	----	486
February	116	63	364	3	1	547
March	163	92	502	1	1	719
April	76	64	422	----	----	562
May	69	25	226	1	----	321
June	19	19	180	2	----	220
Total for year	895	854	2323	19	13	4304
1915—						
July	11	31	95	1	----	138
August	10	16	50	----	2	78
September	22	74	54	1	3	154
October	78	77	90	3	8	261
November	110	67	207	3	4	391
December	108	74	209	1	----	402
1916—						
January	133	48	268	1	3	473
February	252	49	222	1	3	527
March	307	44	259	2	----	702
April	225	29	180	2	1	437
May	149	26	171	1	----	347
June	49	23	81	----	3	156
Total for year	1564	598	1982	15	27	4146

TABLE NO 2—QUARANTINABLE DISEASES IN IOWA.

Number Reported to State Registrar of Vital Statistics, Arranged According to Counties.

PART I—SIX MONTHS JULY 1 TO DEC. 31, 1914.

County	Disease	July	August	September	October	November	December	Total
Adair	(No report received)	----	----	----	----	----	----	----
Adams	Diphtheria	----	----	----	4	----	----	4
	Smallpox	3	----	----	----	3	5	3
Allamakee	Scarlet fever	----	----	----	----	10	----	8
	Diphtheria	----	----	----	2	----	----	10
	Anterior pollomyelitis	----	----	----	----	1	----	2
Appanoose	Scarlet fever	----	----	----	1	3	----	1
	Diphtheria	----	----	1	----	----	----	4
	Anterior pollomyelitis	----	----	----	----	2	----	1
Audubon	Scarlet fever	----	----	----	----	3	2	2
Benton	Diphtheria	----	----	----	2	1	29	5
	Scarlet fever	----	----	----	----	22	22	32
Black Hawk	Diphtheria	----	----	----	----	----	3	22
	Smallpox	1	----	----	----	1	----	3
	Scarlet fever	1	----	----	3	1	----	1
Boone	Diphtheria	----	----	----	----	----	1	4
	Smallpox	----	----	----	----	2	----	1
Bremer	Smallpox	----	----	2	4	3	4	2
Buchanan	Scarlet fever	----	----	----	----	----	1	13
	Smallpox	----	----	----	1	----	6	1
Buena Vista	Smallpox	----	----	----	----	----	1	7
Butler	Scarlet fever	----	----	----	3	1	1	1
Calhoun	Diphtheria	----	----	----	----	----	----	5
Carroll	(No report received)	----	----	----	----	----	----	----
Cass	Scarlet fever	----	----	----	11	----	4	11
	Diphtheria	----	1	----	8	1	2	12
	Smallpox	----	----	----	12	7	13	23
Cedar	Diphtheria	----	1	----	----	1	----	2
Cerro Gordo	Scarlet fever	----	----	----	1	----	1	2
Cherokee	Diphtheria	----	----	----	----	1	----	1
	Smallpox	----	----	----	----	1	----	1
Chickasaw	Scarlet fever	----	----	----	----	----	4	4
Clarke	Smallpox	----	----	----	1	1	----	2
Clay	Diphtheria	2	1	----	----	----	----	3
Clayton	Scarlet fever	2	----	1	----	----	1	4
Clinton	Scarlet fever	----	2	----	----	2	5	9
	Diphtheria	3	1	----	2	1	----	7
	Smallpox	----	----	----	----	1	1	2
Crawford	Scarlet fever	----	----	----	----	----	2	2
Dallas	Diphtheria	3	----	----	----	----	----	5
	Diphtheria	1	----	----	----	----	----	1
Davis	Smallpox	20	----	----	----	1	1	20
	Scarlet fever	----	----	----	----	----	----	2
Decatur	Scarlet fever	----	1	----	----	2	8	1
Delaware	Scarlet fever	----	----	----	----	1	----	10
Des Moines	Smallpox	----	1	----	----	----	----	2
Dickinson	(No report received)	----	----	----	----	----	----	----
Dubuque	(No report received)	----	----	----	----	----	----	----
Emmet	(No report received)	----	----	----	2	1	9	12
Fayette	Smallpox	----	----	----	----	1	----	1
Floyd	Scarlet fever	----	----	----	----	----	1	1
	Smallpox	----	----	----	----	----	----	----

Table No. 2—Con.

County	Disease	July	August	September	October	November	December	Total
Franklin	Scarlet fever					1		1
Fremont	Scarlet fever				1			1
	Smallpox						1	1
Greene	(No report received)							
Grundy	Smallpox						1	1
Guthrie	Scarlet fever		1			1		2
Hamilton	Scarlet fever						1	1
	Diphtheria		1		2	1		4
Hancock	(No report received)							
Hardin	Smallpox	1						1
Harrison	(No report received)							
Henry	Smallpox	3						3
	Cerebrospinal meningitis					1		1
Howard	(No report received)							
Humboldt	Smallpox						8	8
Ida	Smallpox		1	1	23	8		33
	Anterior poliomyelitis			1				1
Iowa	Cerebrospinal meningitis					1		1
	Anterior poliomyelitis					1		1
Jackson	Scarlet fever			2	1	3		6
	Diphtheria				1			1
Jasper	Scarlet fever			5	1	2		8
	Diphtheria	3			1	3		7
	Smallpox	1		4				5
Jefferson	Smallpox	1						1
Johnson	Diphtheria			1		3		4
Jones	Diphtheria		2					2
	Smallpox				1			1
Keokuk	Scarlet fever						2	2
	Smallpox					16	20	36
	Cerebrospinal meningitis						1	1
Kossuth	(No report received)							
Lee	(No report received)							
Linn	Scarlet fever	1		1	2	1	3	8
	Diphtheria	11	12	8	44	49	32	156
	Smallpox	1	2	1	3	3	4	14
Louisa	Scarlet fever	5	1					6
Lucas	(No report received)							
Lyon	Smallpox	10		26	4			40
	Cerebrospinal meningitis		1					1
Madison	(No report received)							
Mahaska	Scarlet fever				11	6	3	20
	Diphtheria			1		2		3
Marion	Scarlet fever		1					1
	Diphtheria			1		4		5
	Smallpox	1					1	2
Marshall	Scarlet fever				1			1
	Diphtheria	2						2
Mills	(No report received)							
Mitchell	Scarlet fever		1					1
Monona	(No report received)							
Monroe	Scarlet fever	2		1		2		5
	Diphtheria	3	5		6	3	5	22
Montgomery	Scarlet fever			9	14			23
	Diphtheria				1			1
	Smallpox					2		2
Muscatine	Scarlet fever				2	6		8
	Diphtheria		1		1			2
	Smallpox					1		1
O'Brien	Scarlet fever				1			1
	Smallpox					1	3	4
Osceola	Smallpox						1	1
	Anterior poliomyelitis			1				1
Page	Scarlet fever		2	6				8
	Diphtheria	1	1	1				3
Palo Alto	(No report received)							
Plymouth	Smallpox	1						1
Pocahontas	Scarlet fever						1	1
	Diphtheria					1		1

Table No. 2—Con.

County	Disease	July	August	September	October	November	December	Total
Polk	Scarlet fever	3	10		4	13	14	44
	Diphtheria	7	4	9	22	9	29	80
	Smallpox	9	4	4	7	17	9	50
	Cerebrospinal meningitis				1		1	2
Pottawattamie	Scarlet fever	3		1		1	2	7
	Diphtheria			8	11	15	12	46
	Smallpox	21			3	91	107	222
Poweshiek	Scarlet fever				3	3		6
	Smallpox					6	1	7
Ringgold	Diphtheria						2	2
Sac	Diphtheria				1	4		5
	Anterior poliomyelitis			1	4			5
Scott	Scarlet fever		1	9	16	8	7	41
	Diphtheria				17	20	10	47
	Smallpox			7	2	2	5	16
Shelby	Scarlet fever						1	1
	Smallpox				1	1	1	3
Sioux	(No report received)							
Story	Diphtheria				1			1
Tama	Diphtheria					1		1
	Cerebrospinal meningitis				1			1
Taylor	(No report received)							
Union	Smallpox	1						1
Van Buren	Smallpox					4	3	7
Wapello	Scarlet fever						2	2
	Smallpox						4	4
Warren	Scarlet fever						3	3
	Diphtheria			4			1	5
	Smallpox	1	1					2
Washington	Smallpox			1		1	1	3
Wayne	Diphtheria					1		1
Webster	Scarlet fever	3	3		1			7
	Diphtheria				1	2	3	6
	Smallpox	2					1	3
Winnebago	Scarlet fever	1						1
	Diphtheria					1		1
	Smallpox					1	2	3
Winneshiek	Scarlet fever				1			1
	Diphtheria					7	6	13
Woodbury	Scarlet fever			3				3
	Diphtheria					1		1
	Cerebrospinal meningitis	2						2
Worth	Scarlet fever					2		2
	Diphtheria		1	2				3
Wright	Scarlet fever				7	2	2	11
	Diphtheria				8	4	4	16
	Smallpox				1			1
Total		135	65	124	290	392	443	1,449

TABLE NO 2—QUARANTINABLE DISEASES IN IOWA.

Number Reported to State Registrar of Vital Statistics, Arranged According to Counties.

PART II—SIX MONTHS JAN. 1 TO JUNE 30, 1915.

County	Disease	January	February	March	April	May	June	Total
Adair	Scarlet fever	1	1					2
	Smallpox					1		1
Adams	Smallpox							
Allamakee	Scarlet fever	1	2	2	1			6
	Diphtheria	1			1			2
	Smallpox						1	1
Appanoose	Scarlet fever	1	1	1	2	4		9
	Smallpox				4	2	2	8
Audubon	Diphtheria			1				1
	Smallpox				2	1		3
Benton	Scarlet fever	2	3					5
	Diphtheria			1	1		1	3
	Smallpox		2					2
Black Hawk	Scarlet fever	40	34	34	12	17	2	148
	Diphtheria	14	6	4	1	1		28
	Smallpox		6	6	3	3	2	20
Boone	Scarlet fever	3	1		1	1		6
	Diphtheria	2		3				5
	Smallpox	4	16	17	9	6	4	56
	Cerebrospinal meningitis		1					1
Bremer	Scarlet fever	1	1					2
	Diphtheria				1			1
	Smallpox		3					3
Buchanan	Scarlet fever	1	1		1		1	4
	Diphtheria	1		1				2
	Smallpox				1	1		2
Buena Vista	Smallpox		24	17		6	6	53
Butler	Scarlet fever		2	2	1			7
	Smallpox					2	1	3
Calhoun	Smallpox			1	1	2	1	6
Carroll	Smallpox			1	1	2	1	5
Cass	Scarlet fever			1				1
	Diphtheria	1						1
	Smallpox	26	11	8	2		6	53
Cedar	Diphtheria				4			4
	Smallpox		1		4			5
Cerro Gordo	Scarlet fever	4	9	2	2	5	2	24
	Diphtheria	1			1	2		4
	Smallpox	1			2	1	1	5
Cherokee	Scarlet fever			2	1			3
	Smallpox	11		1	3	2		17
Chickasaw	Scarlet fever	2			1			3
	Smallpox			1				1
Clarke	Scarlet fever	1						1
	Smallpox	4	8	1	1	1		15
Clay	Scarlet fever				1			1
	Smallpox	1	1		2	1		5
Clayton	Scarlet fever				7	2		9
	Diphtheria				1	1		2
Clinton	Scarlet fever	4	3	4		1	1	13
	Diphtheria	2	4	4	1	2	4	17
	Smallpox		22	1	1			24

Table No. 2—Con.

County	Disease	January	February	March	April	May	June	Total
Crawford	Scarlet fever	1						1
	Diphtheria	1						1
	Smallpox	1			1			2
Dallas	Scarlet fever		1			1		2
	Diphtheria							
	Smallpox		1					1
Davis	Scarlet fever	1	1					2
	Smallpox	1			1			2
Decatur	Scarlet fever		1			1		2
	Diphtheria							
Delaware	Scarlet fever	2	1	1				4
	Diphtheria		1	1				2
	Smallpox	6	5	13	2			26
Des Moines	Scarlet fever	5	1	4	3		1	14
	Diphtheria	1				1	1	3
	Smallpox	2			1			3
Dickinson	Smallpox							
Dubuque	Diphtheria	9	2	1				12
	Smallpox	32	12					44
Emmet	(No report received)							
Fayette	Scarlet fever		3					3
	Smallpox	6	4	3				13
Floyd	Scarlet fever			1				1
	Diphtheria	1						1
	Smallpox			1	4			5
Franklin	Scarlet fever	1						1
Fremont	Diphtheria		2	1	1	1		5
	Smallpox	3	1		1			5
Greene	(No report received)							
Grundy	(No report received)							
Guthrie	Scarlet fever		3					3
	Smallpox	2		18	12	4	3	34
Hamilton	Scarlet fever				1			1
	Diphtheria					1	4	5
	Smallpox	1	1				3	5
	Cerebrospinal meningitis		1					1
Hancock	Smallpox		1	17	16			34
Hardin	Scarlet fever	5	2	2	6	4		19
	Smallpox		2	20	27	3	3	55
Harrison	Scarlet fever	1	3	5	8			17
	Smallpox	11		3			2	16
Henry	(No report received)							
Howard	(No report received)							
Humboldt	Scarlet fever		1					1
	Smallpox		2					2
Ida	(No report received)							
Iowa	(No report received)							
Jackson	Scarlet fever			1				1
Jasper	Diphtheria	2						2
	Smallpox	2	3	2			10	17
	Cerebrospinal meningitis					1	1	2
Jefferson	(No report received)							
Johnson	Diphtheria					1	1	2
	Smallpox	2		5	2			9
	Smallpox						1	1
Jones	Scarlet fever	4						4
Keokuk	Smallpox	17	4	21	15	7		64
	Anterior poliomyelitis			1				1
Kossuth	Diphtheria		1					1
Lee	Scarlet fever		1					1
	Cerebrospinal meningitis						1	1
Linn	Scarlet fever		2	1				3
	Diphtheria	16	10	10	4	1	1	43
	Smallpox	6	8	4	7	7		32
Louisa	(No report received)					1		1
Lucas	Smallpox			2		1		3
Lyon	Smallpox			1				1
Madison	Anterior poliomyelitis			1				1
Mahaska	Scarlet fever	12	2	1		1	1	7
	Smallpox	3	6	3			9	21

Table No. 2—Con. County	Disease	January	February	March	April	May	June	Total
Marion	Scarlet fever			2				2
	Diphtheria		2					2
	Smallpox	1		1	3	15		20
Marshall	Scarlet fever	2	3	2	2	1		10
	Diphtheria		1					1
	Smallpox		1		1			2
Mills	Scarlet fever			2		6	1	9
Mitchell	Scarlet fever	1						1
	Smallpox					1		1
Monona	Smallpox			2				2
Monroe	Scarlet fever			1		1		2
	Diphtheria	1	2	2	2			7
	Smallpox	1	1	1	2	2	3	10
Montgomery	Scarlet fever					2	1	3
Muscatine	Scarlet fever		3	2	3			8
	Diphtheria		2	1	1	1		5
	Smallpox	1	1		3	9	2	16
O'Brien	Scarlet fever	2			1			3
	Smallpox	10	2		5	2	2	21
Osceola	Scarlet fever		1	1				2
	Diphtheria	2						2
	Smallpox	1						1
Page	Scarlet fever			1				1
	Diphtheria	1						1
	Smallpox	1				3	1	5
Palo Alto	Scarlet fever					2		2
	Diphtheria	1				2	1	4
	Smallpox		1					1
Plymouth	Scarlet fever	1		1				2
	Smallpox	2		1	3	13		19
Pocahontas	Scarlet fever				1			1
	Smallpox		2	1				3
	Cerebrospinal meningitis	1						1
Polk	Scarlet fever	6	6	11		3	1	27
	Diphtheria	12	10	12	17	7	1	59
	Smallpox	30	42	43	25	15	16	171
	Cerebrospinal Meningitis			1				1
Pottawattamie	Scarlet fever		1	5				6
	Diphtheria		5	4	9			18
	Smallpox	2	80	124	104	15		325
Poweshiek	Scarlet fever	1	1					2
	Smallpox	1	7	7				15
Ringgold	Diphtheria				1			1
	Smallpox					6	3	9
Sac	Diphtheria	1						1
	Smallpox	3		4				7
Scott	Scarlet fever	14	6	9	6	4	2	41
	Diphtheria	10	8	7	9		5	39
	Smallpox	28	70	121	76	52	65	412
	Cerebrospinal meningitis		1					1
Shelby	Scarlet fever		1	1				2
	Smallpox	16		1	6	2	1	26
Sioux	Scarlet fever		1					1
	Smallpox	12		1				13
Story	Scarlet fever	1	7	28		2		38
	Diphtheria	1						1
	Smallpox			1	1			2
Tama	Scarlet fever	1		5	4	6		16
	Diphtheria			1	4			5
	Smallpox			1	5	1		7
Taylor	Smallpox						3	3
Union	(No report received)							
Van Buren	Scarlet fever	1						1
	Smallpox		1	4	12	38	7	62
Wapello	Scarlet fever	1						1
	Smallpox	7		2	3			12
Warren	Scarlet fever			1				1
	Small pox				1			1
Washington	Scarlet fever			1				1
	Diphtheria					1		1

Table No. 2—Con. County	Disease	January	February	March	April	May	June	Total
Wayne	Smallpox			19	33		5	57
	Scarlet fever				5	6	4	15
	Smallpox				6			6
Webster	Cerebrospinal meningitis	1						1
	Scarlet fever		1	8	6	1	1	17
	Diphtheria	13	1	1	4			19
	Smallpox	1	6	4	10		1	22
Winnebago	Cerebrospinal	1						1
	Scarlet fever		3	5	1		1	10
	Diphtheria	1		2				3
Winneshiek	Smallpox	1	1	1				3
	Diphtheria			2				2
Woodbury	Smallpox						2	2
Worth	(No report received)							
Wright	(No report received)							
	Scarlet fever	2	1	2	1			6
	Diphtheria	2	3	3	1			9
	Smallpox		3					3
Total		486	547	719	562	321	220	2,855

TABLE NO 2—QUARANTINABLE DISEASES IN IOWA.

Number Reported to State Registrar of Vital Statistics, Arranged According to Counties.

PART III—SIX MONTHS JULY 1 TO DEC. 31, 1915.

County	Disease	July	August	September	October	November	December	Total
Adair	(No report received)							
Adams	Scarlet fever			1	2		2	5
	Anterior poliomyelitis			1				1
Allamakee	Scarlet fever						2	2
	Smallpox			2				2
Appanoose	Scarlet fever			1	1	1		3
	Smallpox	1						1
Audubon	Scarlet fever					1		1
Benton	Scarlet fever	1	1	1		1		4
	Diphtheria	1	1	6	5	1	1	15
	Smallpox				14		3	17
Black Hawk	Scarlet fever				1	9	7	17
	Diphtheria	3		5	5	3	1	17
	Smallpox			2	4	1	21	28
	Anterior poliomyelitis				3			3
Boone	Scarlet fever			1		1		2
	Diphtheria			1	1	2		4
	Smallpox	5				1		6
Bremer	Cerebrospinal meningitis			1				1
	Anterior poliomyelitis					1		1
Buchanan	Scarlet fever					1		1
	Smallpox					1	1	2
Buena Vista	(No report received)							
Butler	Diphtheria			1				1
Calhoun	(No report received)							
Carroll	(No report received)							
Cass	Scarlet fever			1				1
	Smallpox	9		2	1	7	4	23
Cedar	Scarlet fever						8	8
	Diphtheria				1			1
Cerro Gordo	Scarlet fever	2			1	4	1	8
	Diphtheria	2		3	1			6
	Smallpox	1					1	2
Cherokee	Scarlet fever					12	3	15
	Diphtheria						3	3
	Smallpox					41	36	77
Chickasaw	Diphtheria	1	1					2
Clarke	Smallpox						17	17
	Anterior poliomyelitis				1			1
Clay	Smallpox					1	2	3
Clayton	Scarlet fever						1	1
	Diphtheria			2		3		5
	Smallpox			1	4			5
Clinton	Scarlet fever			2		5	1	8
	Diphtheria		1	1		4	2	8
	Smallpox		2			5	21	28
Crawford	Diphtheria			1				1
	Smallpox						27	27
Dallas	Smallpox		6					6
Davis	(No report received)							
Decatur	Smallpox	1						1

Table No. 2—Con.

County	Disease	July	August	September	October	November	December	Total
Delaware	Scarlet fever				1		1	2
	Smallpox				3			3
Des Moines	Scarlet fever		1	1	7	4	7	20
	Diphtheria				2	1	2	5
Dickinson	Scarlet fever		2					2
Dubuque	(No report received)							
Emmet	(No report received)							
Fayette	Scarlet fever	1						1
	Diphtheria				4			4
Floyd	(No report received)							
Franklin	Smallpox					3	5	8
	Anterior poliomyelitis				1			1
Fremont	Diphtheria	2		15		2	14	33
	Smallpox		1		16	57		74
Greene	Scarlet fever						2	2
Grundy	Scarlet fever				1	10		11
	Diphtheria	1						1
	Smallpox				1			1
Guthrie	Diphtheria				4		1	5
Hamilton	Scarlet fever	1		1				2
	Diphtheria	2						2
Hancock	Scarlet fever				1			1
Hardin	Scarlet fever						2	2
	Smallpox	2	2	8	3	5	2	22
Harrison	Scarlet fever					2		2
	Diphtheria		1			2		3
	Cerebrospinal meningitis				1			1
Henry	(No report received)							
Howard	(No report received)							
Humboldt	(No report received)							
Ida	Scarlet fever					2	2	4
Iowa	Smallpox						1	1
Jackson	Scarlet fever				1		4	5
Jasper	Scarlet fever				1		1	2
	Diphtheria		1	2	6	18	12	39
	Smallpox	1					1	2
	Cerebrospinal meningitis					1		1
Jefferson	(No report received)							
Johnson	Scarlet fever				1			1
	Diphtheria	5					1	6
	Scarlet fever		2		5	1	3	11
Jones	Scarlet fever				3		1	4
Keokuk	Smallpox	2	5					7
	Scarlet fever						2	2
Kossuth	Smallpox						11	11
Lee	Scarlet fever		1		1	2	3	7
Linn	Diphtheria	5	2	6	6	4	3	26
	Smallpox	7	4	6	4	10	13	44
	Scarlet fever			1	2		2	5
Louisa	(No report received)							
Lucas	Scarlet fever						1	1
Lyon	(No report received)							
Madison	Scarlet fever		1		1			2
Mahaska	Diphtheria			2	2	1		5
	Smallpox	1	5	7	6			19
Marion	Scarlet fever				3	6	2	11
	Diphtheria	2						2
	Cerebrospinal meningitis				1			1
Marshall	Scarlet fever	2			3	2		7
Mills	Scarlet fever			1			3	4
	Diphtheria			4				4
Mitchell	Scarlet fever			1				1
Monona	Smallpox				4		9	13
Monroe	Scarlet fever			4	1	2	1	8
	Diphtheria			3	7	2	1	13
Montgomery	Scarlet fever	1					7	8
Muscatine	Smallpox	2					2	4
O'Brien	Anterior poliomyelitis					1		1
Osceola	(No report received)							

Table No. 2—Con. County	Disease	July	August	September	October	November	December	Total
Page	Smallpox						1	1
Palo Alto	Diphtheria					1		1
Plymouth	Smallpox	1				1		2
	Anterior poliomyelitis				3			3
Pocahontas	Diphtheria							1
Polk	Scarlet fever		1	1	3	1	4	10
	Diphtheria	4		4	10	6	9	33
	Smallpox	4	5	6	3		1	17
	Cerebrospinal meningitis					1		1
Pottawattamie	Scarlet fever			1		6	10	17
	Diphtheria			5	3	4	4	16
	Smallpox	1			3	1	1	6
	Anterior poliomyelitis			1				1
Poweshiek	Scarlet fever					1		1
Ringgold	Diphtheria			2				2
	Smallpox	6	1					7
Sac	Scarlet fever				1	3		4
	Smallpox		2	6	4	2		14
Scott	Scarlet fever	1		4	11	7	6	29
	Diphtheria	1	4	5	1	4	5	20
	Smallpox	45	15	13	33	62	66	236
	Cerebrospinal meningitis	1						1
Shelby	Diphtheria						1	1
	Smallpox	1						1
	Cerebrospinal meningitis						1	1
Sioux	Scarlet fever				1			1
	Diphtheria					1		1
	Anterior poliomyelitis		2	1				3
Story	Scarlet fever					1		1
	Diphtheria				1			1
Tama	Smallpox	1					1	2
	Scarlet fever				1			1
	Diphtheria						2	2
	Smallpox		4					4
	Anterior poliomyelitis					1		1
Taylor	Scarlet fever				17	10	10	37
	Diphtheria			4	6	3	2	14
	Smallpox	2						2
Union	Scarlet fever				2		2	4
Van Buren	Scarlet fever	2					3	5
	Diphtheria				4			4
Wapello	Smallpox						3	3
Warren	Diphtheria		1	1	1	3	3	9
Washington	Scarlet fever				2	8	1	11
	Smallpox					1		1
Wayne	Scarlet fever				3			3
	Diphtheria				7			7
	Smallpox						1	1
Webster	Scarlet fever		1				1	2
	Diphtheria	1	1		1	2	1	6
	Smallpox	2		1				3
	Cerebrospinal meningitis					1		1
Winnebago	Scarlet fever					1		1
	Diphtheria		1					1
Winneshiek	Diphtheria		1					1
Woodbury	(No report received)							
Worth	Diphtheria						6	6
	Anterior poliomyelitis					1		1
Wright	Scarlet fever					6	2	8
	Diphtheria	1		1				2
	Smallpox				3	8	16	27
Total		138	78	154	261	301	402	1,474

TABLE NO 2—QUARANTINABLE DISEASES IN IOWA.

Number Reported to State Registrar of Vital Statistics, Arranged According to Counties.

PART IV.—SIX MONTHS JAN. 1 TO JUNE 30, 1916. *

County	Disease	January	February	March	April	May	June	Total
Adair	Scarlet fever		1					1
	Smallpox			1				1
Adams	Scarlet fever	6	6					12
	Smallpox		12					12
Allamakee	Scarlet fever			1	7			8
	Smallpox			1				1
Appanoose	Diphtheria			1				1
	Smallpox				1			1
	Anterior poliomyelitis							1
Audubon	(No report received)					1		1
Benton	Scarlet fever	2	1					3
	Diphtheria		2					2
	Smallpox	3	9	11	3	2	12	40
Black Hawk	Scarlet fever	1		1				2
	Diphtheria	59	65	70	1	1		194
	Smallpox		1			6	1	8
Boone	Scarlet fever	2					1	3
	Diphtheria		1	5	2	5		13
	Smallpox			1				1
Bremer	Smallpox			2				2
Buchanan	Scarlet fever		1				2	3
	Diphtheria			3	1			4
Buena Vista	Scarlet fever			1	1			2
	Smallpox			4	3			7
Butler	Scarlet fever	1	3	23	5	1		43
	Smallpox	1						1
	Anterior poliomyelitis				1			1
Calhoun	Smallpox			3	4	1		8
Carroll	Scarlet fever	12		1	2	1		6
	Smallpox		6		1		2	9
Cass	Scarlet fever			1				1
	Diphtheria	1						1
	Smallpox	1						1
	Anterior poliomyelitis		1	1				2
Cedar	Diphtheria	12			1			13
Cerro Gordo	Scarlet fever				2			2
	Smallpox						2	2
	Anterior poliomyelitis	4	2		1	1		8
Cherokee	Scarlet fever	20	1	4	2	2	2	31
	Smallpox			2				2
Chickasaw	Smallpox	1						1
Clarke	Smallpox					3		3
Clay	Smallpox		1	9				10
Clayton	Scarlet fever		4	4		24		32
	Smallpox			1		1		2
Clinton	Scarlet fever				2		1	3
	Diphtheria				2	5		7
	Smallpox	19	2			1		22
Crawford	Smallpox	1	5				1	7
Dallas	Scarlet fever			1				1
	Diphtheria					10	11	21
	Smallpox							

Table No. 2—Con.

County	Disease	January	February	March	April	May	June	Total
Davis	Diphtheria	1						1
Decatur	Scarlet fever	7	1	3	10			21
	Smallpox	12	1	1				14
Delaware	Scarlet fever	3	13	14	8	10	1	49
	Diphtheria		2				2	4
	Smallpox		2					2
Des Moines	Scarlet fever			1		1		2
	Diphtheria	1					1	2
	Smallpox	1	2	6	7			16
	Anterior poliomyelitis						1	1
Dickinson	Scarlet fever	1			3			4
Dubuque	Scarlet fever	1		3	3	2		9
Emmet	(No report received)							
Fayette	Scarlet fever				1	5	4	10
	Diphtheria					1		1
Floyd	Scarlet fever			3				3
Franklin	Scarlet fever			1	1			2
	Smallpox	1	1			1	2	5
Fremont	Scarlet fever		3					3
	Diphtheria			1	1			2
	Smallpox				1			1
Greene	Smallpox					1		1
Grundy	Scarlet fever	2	3		5			10
	Smallpox				1			1
Guthrie	Scarlet fever				1	1		2
	Diphtheria					1		1
Hamilton	Scarlet fever					2		2
Hancock	Scarlet fever				4			4
	Diphtheria						1	1
	Smallpox	1	7					8
Hardin	Diphtheria						2	2
	Smallpox			19	37	15	1	72
Harrison	Scarlet fever	1	5	11		2		19
	Diphtheria	1						1
	Smallpox	2	4					7
Henry	Scarlet fever		5					5
	Diphtheria			1				1
	Smallpox	1	1	2				4
Howard	Smallpox				1	9		10
Humboldt	Scarlet fever			1				1
	Diphtheria						1	1
Ida	Scarlet fever						2	2
	Diphtheria			1				1
Iowa	Smallpox	1						1
	Anterior poliomyelitis		2					2
Jackson	Scarlet fever	2						2
	Diphtheria			1				1
	Smallpox					2		2
Jasper	Scarlet fever	2	1	3	9	4	2	24
	Diphtheria	7	8	3	3	1		22
	Smallpox	1						1
	Cerebrospinal meningitis			1				1
Jefferson	Smallpox			1				1
Johnson	Scarlet fever			1				1
	Diphtheria	1	3		2		1	7
	Smallpox	2	2	6		3	6	19
Jones	(No report received)							
Keokuk	Scarlet fever	3	2					5
	Smallpox	6		19	6	3		34
Kossuth	Scarlet fever		2	8				10
Lee	Scarlet fever				5			5
	Smallpox			1	17	22	13	53
Linn	Scarlet fever	8	7	6	1		2	24
	Diphtheria	7	4	2		4	1	18
	Smallpox	29	17	7	13	7	2	70
	Cerebrospinal meningitis	1						1
	Anterior poliomyelitis		1					1
Louisa	Scarlet fever	4	1	2	1			8
	Diphtheria			1				1
	Smallpox	2	2	2	1		2	9

Table No. 2—Cont.

County	Disease	January	February	March	April	May	June	Total
Lucas	Scarlet fever	1	3					4
Lyon	Scarlet fever		1					1
Madison	Diphtheria	1						1
	Smallpox		2					2
Mahaska	Scarlet fever	7		6				13
	Diphtheria	3	3	1				6
	Smallpox	1	1					2
Marion	Scarlet fever	3			4	1		8
	Diphtheria	1	2	3		1		7
	Smallpox	1						1
Marshall	Smallpox						1	1
Mills	Scarlet fever		7					7
	Diphtheria		3					3
	Smallpox		2			3		5
Mitchell	Diphtheria						1	1
	Smallpox		1					1
Monona	Scarlet fever			18		1		19
	Smallpox				1		1	2
Monroe	Scarlet fever	2				1	1	5
	Diphtheria			2				2
	Smallpox			1	2			3
Montgomery	Scarlet fever	3				1		4
	Smallpox				2			2
Muscatine	Scarlet fever				3		1	4
	Smallpox	1						1
O'Brien	Scarlet fever			1		1		2
	Diphtheria			2				2
	Smallpox	1						1
Osceola	Scarlet fever				1			1
	Diphtheria					1		1
	Smallpox	4						4
Page	Scarlet fever					3		3
	Diphtheria	1	1	17	2			20
	Smallpox	1	2					3
Palo Alto	Diphtheria		1					1
Plymouth	Scarlet fever		3					3
	Diphtheria			1				1
	Smallpox	1						1
Pocahontas	Scarlet fever	1			1			2
	Diphtheria						1	1
	Smallpox					1	1	2
Polk	Scarlet fever	11	35	63	30	15	2	161
	Diphtheria	4	3	9	7	3		26
	Smallpox	1	1	6	1	8	2	19
	Cerebrospinal meningitis		1		1	1		3
Pottawattamie	Scarlet fever	22	22	124	63	34	8	273
	Diphtheria	4	1	3	3	3		14
	Smallpox	3	1	1		1	3	9
	Spinal meningitis				1			1
Poweshiek	Scarlet fever	1		1	1		1	4
	Diphtheria	1	1	3				6
	Smallpox			1				1
Ringgold	Anterior poliomyelitis	1						1
Sac	Smallpox			1				1
Scott	Scarlet fever	9	27	37	27	35	37	142
	Diphtheria	4	7	2	10	4	7	34
	Smallpox	67	78	48	37	30	5	265
	Cerebrospinal meningitis			1				1
Shelby	Scarlet fever	3	1	10	1			15
	Diphtheria					1		1
Sioux	Scarlet fever			4	10	1		15
	Diphtheria					1		1
	Smallpox			10		6	5	21
Story	Scarlet fever	1			3	6		10
	Diphtheria	1						1
	Smallpox			1	2		1	4
Tama	Scarlet fever			1		2	10	13
	Diphtheria			3	1	1		5
	Smallpox	4	21	12	6	6	2	51

Table No. 2—Cont.

County	Disease	January	February	March	April	May	June	Total
Taylor	Scarlet fever	----	8	1	----	----	----	9
	Smallpox	----	----	----	----	1	----	1
Union	(No report received)	----	----	----	----	----	----	----
Van Buren	Diphtheria	----	1	----	----	----	----	1
Wapello	Scarlet fever	2	----	----	----	----	----	2
	Diphtheria	----	1	----	----	----	----	1
	Smallpox	1	----	----	1	1	----	3
Warren	Scarlet fever	1	----	----	----	1	----	2
	Diphtheria	1	1	1	----	----	----	3
Washington	Scarlet fever	4	15	9	1	1	----	30
	Diphtheria	----	----	----	----	----	1	1
	Smallpox	8	1	----	3	----	----	12
Wayne	Smallpox	5	----	----	----	----	----	5
Webster	Scarlet fever	2	----	1	----	5	1	9
	Diphtheria	1	----	----	1	----	----	2
	Smallpox	2	2	1	1	----	3	9
Winnebago	Scarlet fever	1	1	5	1	1	----	9
	Diphtheria	2	----	----	----	1	----	3
	Smallpox	----	----	----	1	----	----	1
Winneshiek	Scarlet fever	----	5	10	----	----	----	15
	Diphtheria	----	1	----	----	----	----	1
Woodbury	Scarlet fever	----	----	----	----	----	1	1
	Smallpox	----	----	----	----	----	1	1
Worth	Scarlet fever	7	5	9	4	6	----	31
	Diphtheria	2	----	----	----	1	----	3
	Smallpox	----	----	1	1	----	10	12
Wright	Scarlet fever	4	4	----	----	----	----	8
	Smallpox	7	----	----	3	----	6	16
Total		473	567	702	437	347	196	2,672

TABLE NO. 3—DEATHS IN IOWA.

Number of Deaths Reported to State Registrar of Vital Statistics, Exclusive of Stillbirths.

PART I—SIX MONTHS JULY 1 TO DEC. 31, 1914.

Classification	July	August	September	October	November	December
Typhoid fever	9	22	43	33	22	22
Malarial fever	----	4	2	1	----	----
Smallpox	----	2	----	----	----	----
Measles	----	----	1	----	----	----
Scarlet fever	6	6	4	4	6	2
Whooping cough	7	17	2	5	5	5
Diphtheria and croup	7	3	4	29	16	19
Influenza	----	----	1	7	6	11
Erysipelas	2	3	1	4	4	6
Other epidemic diseases	----	1	----	----	----	----
Septicaemia	14	18	11	12	11	15
Rabies	----	1	----	----	----	----
Pellagra	----	----	----	----	1	----
Tetanus	2	9	3	9	3	6
Tuberculosis of lungs	95	91	73	92	78	87
Tuberculous meningitis	7	5	2	----	6	6
Pott's disease	----	----	1	1	1	----
Other forms of tuberculosis	15	11	13	16	15	9
Venereal diseases	2	2	3	2	----	4
Cancer and other malignant tumors	151	160	124	98	143	131
Rheumatism	8	4	5	6	7	9
Diabetes	18	19	20	26	24	27
Exophthalmic goitre	2	3	1	3	2	2
Leuchaemia	2	3	4	1	3	4
Anaemia, chlorosis	18	19	9	9	11	17
Other general diseases	32	42	36	31	23	14
Alcoholism	5	----	5	6	3	6
Simple meningitis	14	17	23	18	12	13
Cerebrospinal meningitis	3	5	1	2	1	----
Locomotor ataxia	2	2	5	4	4	2
Acute anterior poliomyelitis	----	2	3	2	1	----
Cerebral hemorrhage, apoplexy	116	139	115	120	132	169
Softening of the brain	1	6	2	2	3	1
Paralysis	28	32	13	26	29	31
General paralysis of insane	6	11	5	7	10	9
Other forms of mental alienation	3	6	4	7	2	4
Epilepsy	6	10	10	6	7	3
Convulsions (nonpuerperal)	4	----	3	2	----	1
Convulsions of infants	2	10	11	9	6	11
Chorea	1	----	----	----	1	----
Neuralgia and neuritis	----	1	----	2	1	----
Other diseases of nervous system	23	8	18	18	18	18
Acute endocarditis	11	11	17	11	9	15
Organic diseases of heart	172	140	132	155	175	191
Angina pectoris	12	9	17	12	14	14
Diseases of arteries, atheroma, aneurysm, etc.	41	23	38	31	29	29
Embolism and thrombosis	8	11	11	17	11	15
Hemorrhage; other diseases of circulatory system	6	2	5	7	4	6
Bronchitis	10	17	11	22	22	26
Bronchopneumonia	9	15	13	19	21	39

TABLE NO. 3—Continued

Classification	July	August	September	October	November	December
Pneumonia	40	32	43	73	96	156
Pulmonary congestion	12	11	12	3	12	20
Asthma	1	2	2	4	3	3
Other diseases of respiratory system	7	10	6	10	8	14
Ulcer of stomach	6	6	5	1	6	10
Other diseases of stomach	26	31	29	24	15	23
Diarrhoea and enteritis (under 2 years)	62	69	67	61	28	12
Diarrhoea and enteritis (2 years and more)	18	43	62	40	19	7
Appendicitis and typhlitis	22	27	21	17	25	16
Hernia and intestinal obstruction	27	25	24	29	22	25
Cirrhosis of liver	12	17	16	8	14	12
Other diseases of liver	20	18	18	8	17	18
Peritonitis	11	16	11	16	9	15
Other diseases of digestive system	25	8	9	8	12	10
Acute nephritis and Bright's disease	100	107	116	115	122	154
Other diseases of kidneys	8	7	4	3	6	4
Diseases of the bladder	2	5	11	6	5	7
Diseases of prostate	8	9	7	5	6	11
Noncancerous tumors and other diseases female genital organs	2	6	2	5	1	
Puerperal septicemia	3	5	3		4	3
Other puerperal diseases	9	13	11	13	13	15
Gangrene	10	4	4	5	8	10
Other diseases of the skin and annexa	1	5	2	2	1	1
Diseases of bones and organs of locomotion	7		2	4	3	5
Malformations and injuries at birth	19	20	25	20	26	28
Premature birth	61	62	40	49	44	69
Congenital debility, atrophy marasmus, etc	33	38	28	40	26	37
Other causes peculiar to early infancy	8	5	13	8	10	7
Senility	77	84	74	70	72	71
Suicide	24	18	29	26	29	20
Poisoning by food, accident	1					
Other acute poisonings	5	2	3	4	9	3
Burns	7	8	9	7	16	14
Absorption of deleterious gases. Suffocation	3	2	6	8	7	3
Accidental drowning	40	25	6	7	6	1
Traumatism by firearms	4	1	7	3	6	11
Traumatism by cutting or piercing instruments	2	1	1			
Traumatism by fall	10	14	18	17	32	6
Traumatism in mines		1	4	6		11
Traumatism by machines	2	4	2	3	1	2
Traumatism by other crushing	2	1	3	3	2	2
R. R. accidents	18	35	24	22	30	14
Street car accidents				3	1	
Automobile accidents	7	19	18	14	25	1
Motorcycle accidents	1	1	1	1		
Injuries by other vehicles	4	7	5		6	3
Injuries by animals	6	7	4	4	3	3
Starvation			3			1
Excessive cold						3
Effects of heat	15	2		1		
Other external violence	10	2	4	4	4	11
Lightning	3	4	2			
Electricity (except lightning)	2	2			1	2
Fractures	14	3	2	1	8	10
Homicide	4	10	7	4	8	8
Not specified or ill-defined	17	22	21	25	29	28
Total	1,699	1,826	1,671	1,700	1,738	1,934

TABLE NO. 3—Continued

Classification	July	August	September	October	November	December
Under 1 year	208	208	208	228	225	258
1 to 5 years	75	128	108	90	61	53
5 to 10 years	29	39	30	26	40	46
10 to 20 years	82	66	75	66	63	79
20 to 30 years	131	110	110	132	107	106
30 to 40 years	130	138	106	119	108	122
40 to 50 years	130	130	144	123	140	146
50 to 60 years	150	182	185	155	179	209
60 to 70 years	234	201	218	232	236	204
70 to 80 years	265	281	267	286	326	346
80 to 90 years	211	187	183	194	200	244
90 years and over	34	32	37	43	32	39
Unknown	1	4		1	1	
Total	1,699	1,826	1,671	1,700	1,738	1,934
Male	932	989	933	920	940	1,093
Female	767	837	738	780	798	841
Total	1,699	1,826	1,671	1,700	1,738	1,934
White	1,675	1,802	1,644	1,678	1,708	1,917
Colored	24	24	27	22	30	17
Total	1,699	1,826	1,671	1,700	1,738	1,934
Native	1,347	1,386	1,232	1,272	1,311	1,420
Foreign	314	410	365	386	399	470
Unknown	38	30	34	42	28	39
Total	1,699	1,826	1,671	1,700	1,738	1,934
Single	572	627	562	580	553	610
Married	661	740	702	668	700	820
Widowed	409	354	356	377	390	445
Divorced	29	23	27	22	29	23
Unknown	28	26	22	24	17	34
Total	1,699	1,826	1,671	1,700	1,738	1,934
Stillbirths	69	66	60	64	66	76

TABLE NO. 3—DEATHS IN IOWA.

Number of Deaths Reported to State Registrar of Vital Statistics, Exclusive of Stillbirths.

PART II—SIX MONTHS JAN. 1 TO JUNE 30, 1915.

Classification	January	February	March	April	May	June
Typhoid fever	16	5	8	20	13	12
Malarial fever	1		1	1	1	
Smallpox	2	2		2	2	1
Measles	3	6	10	12	16	11
Scarlet fever	5		4	3	6	3
Whooping cough	8	12	21	12	14	18
Diphtheria and croup	18	12	9	12	8	6
Influenza	21	50	53	47	8	7
Erysipelas	6	3	11	5	2	7
Septicaemia	13	7	17	11	3	13
Tetanus	2	2	1	2	5	6
Tuberculosis of lungs	85	87	118	111	102	90
Tuberculous meningitis	1	6	7	4	5	4
Pott's disease	1	1	1			1
Other forms of tuberculosis	12	12	6	15	16	6
Venereal diseases	6	7	5	4	3	3
Cancer and other malignant tumors	134	138	159	142	149	136
Rheumatism	20	11	10	15	13	16
Diabetes	45	39	39	38	29	21
Exopthalmic goitre	1	4	3	2	3	1
Leuchaemia	2	2	12	6	5	3
Anaemia, chlorosis	21	13	19	13	18	14
Other general diseases	12	7	11	14	13	7
Alcoholism	4	4	4	5	4	7
Simple meningitis	13	16	16	23	6	8
Cerebrospinal meningitis	3	5	4	2	1	1
Locomotor ataxia	3	3	5	2	6	1
Acute anterior poliomyelitis	1			4	3	1
Cerebral hemorrhage, apoplexy	141	129	158	145	130	115
Softening of the brain	2	5	4	7	4	1
Paralysis	35	20	27	31	23	22
General paralysis of insane	13	7	15	8	14	6
Other forms of mental alienation	3	5	5	5	6	1
Epilepsy	12	11	8	4	13	6
Convulsions (nonpuerperal)		1		1	1	
Convulsions of infants	11	11	5	8	7	4
Chorea			1		1	
Neuralgia and neuritis	2		2	2	2	1
Other diseases of nervous system	23	18	22	27	20	15
Diseases of the ears	2	1	2	4		1
Acute endocarditis	6	7	11	7	8	7
Organic diseases of heart	247	247	233	233	233	168
Angina pectoris	21	14	14	9	20	17
Diseases of arteries, atheroma, aneurysm, etc.	40	28	54	44	33	22
Embolism and thrombosis	14	4	14	15	14	9
Hemorrhage; other diseases of circulatory system	6	9	6	6	6	3
Bronchitis	37	43	39	25	16	16
Bronchopneumonia	60	78	90	49	19	4
Pneumonia	217	241	273	169	74	53
Pulmonary congestion	11	14	7	20	6	4

TABLE NO. 3—Continued

Classification	January	February	March	April	May	June
Asthma	3	8	4	4	1	4
Other diseases of respiratory system	12	11	13	13	10	7
Ulcer of stomach	6	3	7	4	1	7
Other diseases of stomach	17	22	14	20	20	18
Diarrhoea and enteritis (under 2 years)	28	16	14	22	13	16
Diarrhoea and enteritis (2 years and more)	9	12	9	13	12	13
Appendicitis and typhilitis	11	13	27	26	19	20
Hernia and intestinal obstruction	22	22	27	26	29	18
Cirrhosis of liver	16	18	20	18	12	13
Other diseases of liver	26	14	18	32	19	16
Peritonitis	13	7	8	10	12	7
Other diseases of digestive system	18	7	11	9	9	7
Acute nephritis and Bright's disease	147	152	150	113	136	128
Other diseases of kidneys	3	8	4	6	1	2
Diseases of the bladder	3	7	4	4	7	4
Diseases of prostate	7	7	8	11	11	9
Noncancerous tumors and other diseases of female genital organs	7	5	7	7	6	8
Puerperal septicaemia	3	8	5	9	5	5
Other puerperal diseases	10	10	22	19	18	19
Gangrene	8	5	7	11	5	7
Other diseases of the skin and annexa	1	3	2	1	2	
Diseases of bones and organs of locomotion	2	5	2	6	4	2
Malformations and injuries at birth	28	35	45	26	27	30
Premature birth	74	46	59	54	57	72
Congenital debility, atrophy, marasmus, etc.	20	26	29	31	20	21
Other causes peculiar to early infancy	4	6	8	16	8	7
Senility	80	98	97	62	66	70
Suicide	26	21	24	32	22	29
Poisoning by food, accident	1					
Other acute poisonings	4	6	2	2	4	2
Burns	12	6	14	13	9	6
Absorption of deleterious gases. Suffocation	4	9	7	3	4	6
Accidental drowning	1	3	5	9	15	22
Traumatism by firearms	4	2	2	2	2	4
Traumatism by fall	20	10	13	10	13	11
Traumatism in mines	2	5	2	3	2	1
Traumatism by machines	1	6	4	4		3
R. R. accidents	15	15	11	16	20	26
Street car accidents	2	2			1	
Automobile accidents	2	1	3	9	10	18
Injuries by other vehicles	5	3	8	3	3	1
Injuries by animals	2	1	2	2	4	3
Traumatism by other crushing			1		2	2
Other external violence	3	2	7	7	3	3
Lightning				3	3	5
Electricity (except lightning)				1	2	4
Fractures	7	4	10	5	3	7
Homicide	6	6	7	6	2	3
Not specified or ill-defined	28	23	21	19	16	17
Total	2,084	2,046	2,348	2,067	1,767	1,582

TABLE NO. 3—Continued

Classification	January	February	March	March	May	June
Under 1 year	324	349	316	264	195	207
1 to 5 years	70	79	97	83	62	51
5 to 10 years	34	24	44	28	34	22
10 to 20 years	58	56	64	59	78	73
20 to 30 years	109	90	111	159	128	117
30 to 40 years	122	125	127	121	119	123
40 to 50 years	163	165	158	143	133	121
50 to 60 years	214	174	243	213	191	155
60 to 70 years	293	277	341	298	242	222
70 to 80 years	383	385	479	389	346	273
80 to 90 years	271	265	306	264	196	184
90 years and over	42	57	62	46	43	34
Unknown	1					
Total	2,084	2,046	2,348	2,067	1,767	1,582
Male	1,128	1,118	1,226	1,056	960	881
Female	956	928	1,122	1,011	807	701
Total	2,084	2,046	2,348	2,067	1,767	1,582
White	2,059	2,017	2,311	2,043	1,732	1,560
Colored	25	29	37	24	35	22
Total	2,084	2,046	2,348	2,067	1,767	1,582
Native	1,568	1,560	1,717	1,509	1,305	1,176
Foreign	492	458	603	527	426	377
Unknown	24	28	28	31	36	29
Total	2,084	2,046	2,348	2,067	1,767	1,582
Single	656	674	730	636	542	502
Married	835	828	966	843	732	686
Widowed	552	496	602	542	446	353
Divorced	19	21	29	22	19	20
Unknown	22	27	21	24	28	21
Total	2,084	2,046	2,348	2,067	1,767	1,582
Stillbirths	58	70	72	65	86	70

TABLE NO. 3—DEATHS IN IOWA.

Number of Deaths Reported to State Registrar of Vital Statistics, Exclusive of Stillbirths.

PART III—SIX MONTHS JULY 1 TO DEC. 31, 1915.

Classification	July	August	September	October	November	December
Typhoid fever	19	21	21	16	16	29
Malarial fever				1		1
Smallpox						1
Measles	7	7	3	2	3	10
Scarlet fever		2	1	1	1	18
Whooping cough	13	8	10	11	6	12
Diphtheria and croup	4	4	10	16	15	17
Influenza	4		3	3	15	150
Erysipelas	4	3	1	2	7	6
Septicaemia	10	8	8	13	7	11
Rabies	1					
Pellagra		2		2	1	
Tetanus	8	5	7	1	4	2
Tuberculosis of lungs	86	89	81	98	84	109
Tuberculous meningitis	4	3	4	5	3	1
Pott's disease		1	1	2		1
Other forms of tuberculosis	12	9	11	12	16	11
Venereal diseases	4	3	1	2	7	5
Cancer and other malignant tumors	162	171	176	160	134	147
Rheumatism	4	8	7	9	5	8
Diabetes	24	26	21	37	22	60
Exophthalmic goitre	2		3	1	2	5
Leuchaemia	2	2	10	2	1	4
Anaemia, Chlorosis	16	16	14	15	7	12
Other general diseases	9	10	13	8	15	9
Alcoholism	5	4	5	3	5	7
Chronic occupation poisonings						1
Simple meningitis	13	6	10	5	5	6
Cerebrospinal meningitis	1	1	5	2	2	1
Locomotor ataxia	4	3	2	4	1	3
Acute anterior poliomyelitis		2	3	2	1	
Cerebral hemorrhage, apoplexy	95	98	110	138	142	163
Softening of the brain	4	1	3	3	3	3
Paralysis	26	25	23	18	34	30
General paralysis of insane	5	8	11	14	9	16
Other forms of mental alienation	3	3	7	3	3	4
Epilepsy	3	4	3	9	5	9
Convulsions (non-puerperal)			1		4	2
Convulsions of infants	5	5	12	4	10	5
Chorea			1			1
Neuralgia and neuritis	1		2			1
Other diseases of nervous system	14	14	14	22	14	19
Diseases of the ears		1		1	1	3
Acute endocarditis	12	13	8	4	8	14
Organic diseases of heart	155	168	167	189	148	238
Angina pectoris	9	10	9	13	18	17
Diseases of arteries, atheroma, aneurysm, etc.	25	29	26	36	25	37
Embolism and thrombosis	5	10	11	12	12	8
Hemorrhage; other diseases of circulatory system	4	4	3	6	7	4
Bronchitis	6	6	8	20	18	33

TABLE NO. 3—Continued

Classification	July	August	September	October	November	December
Bronchopneumonia	9	12	5	20	23	61
Pneumonia	36	32	44	64	81	255
Pulmonary congestion	3	4	11	16	9	11
Asthma	1	5	7	3	10	7
Other diseases of respiratory system	7	10	10	9	7	29
Ulcer of stomach	12	7	5	3	8	6
Other diseases of stomach	16	12	18	17	23	22
Diarrhoea and enteritis (under 2 years)	32	36	53	27	21	18
Diarrhoea and enteritis (2 years and more)	11	20	15	17	14	7
Appendicitis and typhlitis	24	25	20	18	29	22
Hernia and intestinal obstruction	25	25	16	29	22	22
Cirrhosis of liver	14	11	6	22	16	19
Gallstones	7	7	8	7	7	8
Other diseases of liver	16	13	8	11	9	11
Peritonitis	8	9	5	3	11	13
Other diseases of digestive system	20	6	10	11	9	17
Acute nephritis and Bright's disease	96	102	130	142	120	148
Other diseases of kidneys	2	4	3	9	2	6
Diseases of the bladder	3	1	4	3	6	5
Diseases of prostate	3	10	10	11	5	9
Noncancerous tumors and other diseases female genital organs	7	9	6	2	2	13
Puerperal septicemia	9	7	4	3	5	5
Other puerperal diseases	14	10	11	8	9	17
Gangrene	5	4	4	5	5	5
Other diseases of the skin and annexa	2	3	2		3	
Diseases of bones and organs of locomotion	3	4	4	1	3	
Malformations and injuries at birth	43	22	28	33	38	35
Premature birth	31	32	44	35	65	74
Congenital debility, atrophy, marasmus, etc.	28	26	23	28	32	24
Other causes peculiar to early infancy	6	8	15	3	3	17
Senility	49	65	51	79	82	87
Suicide	22	23	25	35	26	25
Poisoning by food, accident				1		1
Other acute poisonings	11	4	3		4	2
Burns	5	9	10	5	12	15
Absorption of deleterious gases. Suffocation	7	5	5	5	7	9
Accidental drowning	31	14	8	14	2	6
Traumatism by firearms	2	1	3	7	4	4
Traumatism by cutting or piercing instruments	1					
Traumatism by fall	14	13	22	13	11	8
Traumatism in mines	3	3	6	3		2
Traumatism by machines	1	2	2	4	1	3
R. R. accidents	20	21	21	16	15	17
Street car accidents	1	1	2		1	
Automobile accidents	12	14	17	19	15	9
Motorcycle accidents			3			
Injuries by other vehicles	2	5	8	5	2	5
Injuries by animals	3	1	3	3	4	4
Traumatism by other crushing			1	4		
Excessive cold						2
Effects of heat	1					
Other external violence	9	5	9	8	3	2
Lightning	5		1	1	1	
Electricity (except lightning)	1	1	3	1	1	
Fractures	7	6	8	3	6	6
Homicide	5	10	1	5	7	6
Not specified or ill-defined	25	22	22	22	22	33
Deaths from all other causes	5	2	3	4	3	9
Total	1,606	1,544	1,619	1,743	1,642	2,389

TABLE NO. 3—Continued

Classification	July	August	September	October	November	December
Under 1 year	221	185	231	175	230	272
1 to 5 years	53	55	84	86	47	87
5 to 10 years	28	33	21	29	20	44
10 to 20 years	39	37	62	67	68	85
20 to 30 years	110	99	102	106	87	140
30 to 40 years	125	104	102	139	130	149
40 to 50 years	125	150	130	136	147	161
50 to 60 years	157	164	149	171	152	232
60 to 70 years	221	208	244	284	207	310
70 to 80 years	266	254	278	290	285	470
80 to 90 years	145	172	190	197	200	302
90 years and over	26	23	25	22	21	61
Unknown				1		1
Total	1,506	1,544	1,619	1,743	1,642	2,389
Male	871	871	915	986	921	1,269
Female	665	673	704	757	721	1,120
Total	1,536	1,544	1,619	1,743	1,642	2,389
White	1,516	1,530	1,605	1,723	1,624	2,364
Colored	20	14	14	20	18	25
Total	1,536	1,544	1,619	1,743	1,642	2,389
Native	1,151	1,195	1,217	1,269	1,209	1,776
Foreign	356	336	370	447	392	597
Unknown	29	23	32	27	41	42
Total	1,536	1,544	1,619	1,743	1,642	2,389
Single	627	667	645	644	625	734
Married	669	678	690	772	696	901
Widowed	208	200	245	443	272	648
Divorced	17	32	17	19	27	31
Unknown	20	19	22	25	22	25
Total	1,536	1,544	1,619	1,743	1,642	2,389
Stillbirths	78	78	68	79	67	76

TABLE NO. 3—DEATHS IN IOWA.

Number of Deaths Reported to State Registrar of Vital Statistics, Exclusive of Stillbirths.

PART IV—SIX MONTHS JAN. 1 TO JUNE 30, 1916.

Classification	January	February	March	April	May	June
Typhoid	15	14	8	9	10	7
Malarial fever	------	1	------	------	1	2
Smallpox	------	1	------	------	------	------
Measles	23	30	52	55	32	13
Scarlet fever	9	14	25	13	12	5
Whooping cough	10	23	17	9	14	13
Diphtheria and croup	7	12	11	5	11	6
Influenza	418	133	75	35	11	11
Erysipelas	13	10	18	7	9	8
Septicaemia	7	14	19	17	10	10
Rabies	------	1	------	------	------	------
Pellagra	------	1	------	------	------	------
Tetanus	1	1	1	2	1	4
Tuberculosis of lungs	121	105	116	116	93	97
Tuberculous meningitis	6	7	6	8	6	12
Pott's disease	1	1	2	3	2	------
Other forms of tuberculosis	21	13	17	12	9	14
Venereal diseases	8	5	6	7	10	4
Cancer and other malignant tumors	162	153	156	165	164	138
Rheumatism	11	19	8	12	11	16
Diabetes	46	35	43	32	33	83
Exophthalmic goitre	4	1	1	3	4	2
Leuchaemia	7	3	2	5	1	2
Anaemia, chlorosis	15	19	14	20	17	14
Other general diseases	7	10	12	8	6	9
Alcoholism	4	4	2	2	5	1
Simple meningitis	5	10	15	9	11	5
Cerebrospinal meningitis	1	1	8	7	2	2
Locomotor ataxia	------	4	7	3	3	2
Acute anterior poliomyelitis	1	2	1	1	------	2
Cerebral hemorrhage, apoplexy	194	151	134	168	150	145
Softening of the brain	4	7	4	------	10	3
Paralysis	33	31	33	32	36	10
General paralysis of insane	13	14	12	7	9	8
Other forms of mental alienation	4	3	7	9	6	5
Epilepsy	12	13	6	8	9	9
Convulsions (nonpuerperal)	2	------	2	1	------	------
Convulsions of infants	7	4	7	4	14	10
Chorea	------	------	------	1	1	------
Neuralgia and neuritis	2	------	------	2	------	1
Other diseases of nervous system	21	18	22	20	14	6
Diseases of the ears	2	6	5	4	6	3
Acute endocarditis	8	12	14	11	8	14
Organic diseases of heart	271	211	247	236	194	174
Angina pectoris	14	15	15	12	15	10
Diseases of arteries, atheroma, aneurysm, etc.	49	41	39	39	48	33
Embolism and thrombosis	11	13	13	14	20	9
Hemorrhage; other diseases of circulatory system	6	7	9	5	7	1
Bronchitis	38	28	23	30	14	10
Bronchopneumonia	55	50	68	50	25	15
Pneumonia	456	184	231	169	107	53
Pulmonary congestion	16	10	8	5	7	5

TABLE NO. 3—Continued

Classification	January	February	March	April	May	June
Asthma	14	3	6	11	2	5
Other diseases of respiratory system	15	15	17	15	12	10
Ulcer of stomach	9	9	6	9	2	7
Other diseases of stomach	21	18	21	16	16	12
Diarrhoea and enteritis (under 2 years)	15	24	16	17	27	20
Diarrhoea and enteritis (2 years and more)	5	6	4	11	6	5
Appendicitis and typhlitis	31	28	36	22	29	28
Hernia and intestinal obstruction	28	20	37	26	22	22
Cirrhosis of liver	13	14	19	15	16	12
Gallstones	9	4	11	9	9	9
Other diseases of liver	14	11	17	11	13	8
Peritonitis	18	8	15	8	11	15
Other diseases of digestive system	13	13	13	11	14	8
Acute nephritis and Bright's disease	145	151	137	118	137	105
Other diseases of kidneys	7	6	8	4	5	2
Diseases of the bladder	2	3	4	------	3	5
Diseases of prostate	15	9	5	12	8	14
Noncancerous tumors and other diseases female genital organs	10	10	13	6	4	6
Puerperal septicaemia	7	8	21	6	9	2
Other puerperal diseases	20	17	17	21	18	12
Gangrene	------	6	3	8	7	10
Other diseases of the skin and annexa	1	1	3	1	4	2
Diseases of bones and organs of locomotion	1	2	4	9	4	4
Maformations and injuries at birth	30	46	37	42	31	30
Premature birth	78	45	56	60	49	52
Congenital debility, atrophy, marasmus, etc.	30	32	48	20	43	30
Other causes peculiar to early infancy	8	7	13	13	9	7
Senility	96	81	75	83	75	47
Suicide	24	20	23	29	28	28
Poisoning by food, accident	------	1	------	------	------	------
Other acute poisonings	2	1	4	3	1	1
Burns	6	4	10	5	9	3
Absorption of deleterious gases. Suffocation	7	4	4	3	5	1
Accidental drowning	------	1	2	13	19	16
Traumatism by firearms	2	6	2	------	1	3
Traumatism by fall	10	17	13	5	12	16
Traumatism in mines	4	3	2	------	2	2
Traumatism by machines	1	1	3	7	2	2
R. R. accidents	7	19	9	6	10	37
Street car accidents	------	------	------	3	------	2
Automobile accidents	1	2	6	9	15	21
Motorcycle accidents	------	------	------	------	------	1
Injuries by other vehicles	2	1	3	2	1	6
Injuries by animals	2	2	1	2	2	2
Traumatism by other crushing	------	1	1	1	1	------
Starvation	1	------	------	------	------	------
Excessive cold	------	2	1	------	------	------
Other external violence	7	18	16	6	6	9
Lightning	------	------	------	------	1	1
Electricity (except lightning)	1	1	1	------	------	2
Fractures	15	11	3	6	5	8
Homicide	3	4	2	2	4	5
Not specified or ill-defined	29	24	34	27	13	13
Deaths from all other causes	5	3	3	3	5	1
Total	2,925	2,208	2,336	2,108	1,916	1,634

TABLE NO. 3—Continued

Classification	January	February	March	April	May	June
Under 1 year	304	265	323	275	275	212
1 to 5 years	86	96	138	104	88	64
5 to 10 years	51	50	63	39	43	24
10 to 20 years	88	73	82	80	67	79
20 to 30 years	149	146	147	123	121	114
30 to 40 years	147	155	151	133	133	108
40 to 50 years	184	137	175	164	121	145
50 to 60 years	270	194	237	218	196	158
60 to 70 years	395	302	323	278	259	232
70 to 80 years	653	446	385	402	340	295
80 to 90 years	505	287	270	254	226	177
90 years and over	93	67	42	36	46	26
Unknown	------	------	------	2	1	------
Total	2,925	2,208	2,336	2,168	1,916	1,634
Male	1,486	1,176	1,195	1,092	1,035	884
Female	1,439	1,032	1,141	1,016	881	750
Total	2,925	2,208	2,336	2,108	1,916	1,634
White	2,903	2,180	2,318	2,080	1,879	1,610
Colored	22	28	18	28	37	24
Total	2,925	2,208	2,336	2,108	1,916	1,634
Native	2,105	1,663	1,828	1,595	1,445	1,258
Foreign	763	523	485	479	442	349
Unknown	57	22	23	34	29	27
Total	2,925	2,208	2,336	2,108	1,916	1,634
Single	767	691	798	697	637	542
Married	1,213	899	966	867	813	677
Widowed	901	570	528	499	422	374
Divorced	21	32	32	27	22	20
Unknown	23	16	12	18	22	21
Total	2,925	2,208	2,336	2,108	1,916	1,634
Stillbirths	82	82	101	80	93	77

TABLE NO. 4—DEATHS IN IOWA, 1914 AND 1915.

Number of Deaths Reported to Registrar of Vital Statistics for Calendar Years 1914 and 1915.

Classification	1914	1915
Total	22,261	22,367
Age Classification		
Under one year	2,999	2,949
One to five years	1,061	854
Five to ten years	449	367
Ten to twenty years	842	787
Twenty to thirty years	1,432	1,358
Thirty to forty years	1,521	1,466
Forty to fifty years	1,654	1,732
Fifty to sixty years	2,214	2,216
Sixty to seventy years	3,049	3,212
Seventy to eighty years	3,900	4,158
Eighty to ninety years	2,635	2,762
Ninety years and over	449	473
Unknown	56	3
Sex Classification		
Male	12,204	12,199
Female	10,057	10,168
Color Classification		
White	21,936	22,094
Colored	325	273
Nativity		
Native	16,669	16,626
Foreign	5,174	5,371
Unknown	418	370
Social Relation		
Single	7,397	7,102
Married	9,211	9,288
Widowed	5,111	5,462
Divorced	297	251
Unknown	285	276
Stillbirths	796	867
Deaths in state institutions	462	535
Classified as to Cause of Death		
Typhoid fever	225	196
Malarial fever	8	5
Smallpox	11	10
Measles	30	90
Scarlet fever	67	44
Whooping cough	97	145
Diphtheria and croup	159	131
Influenza	116	391

TABLE NO. 4—Continued

Classification	1914	1915
Erysipelas	62	57
Other epidemic diseases	3	
Septicaemia	180	121
Rabies	1	1
Pellagra	2	5
Tetanus	49	45
Tuberculosis of lungs	1,151	1,140
Tuberculous meningitis	66	47
Potts' disease	10	9
Other forms of tuberculosis	145	139
Venereal disease	30	50
Cancer and other malignant tumors	1,610	1,808
Rheumatism	82	126
Diabetes	314	411
Exopthalmic goitre	23	27
Leuchaemia	34	51
Anaemia, chlorosis	180	178
Other general diseases	241	128
Alcoholism	61	57
Chronic occupation poisoning		1
Simple meningitis	224	127
Cerebrospinal meningitis	31	28
Locomotor ataxia	30	37
Acute anterior poliomyelitis	16	17
Cerebral hemorrhage, apoplexy	1,629	1,564
Softening of the brain	38	40
Paralysis	330	314
General paralysis of insane	100	126
Other forms of mental alienation	48	48
Epilepsy	79	87
Convulsions (non-puerperal)	18	10
Convulsions of infants	111	87
Chorea	8	4
Neuralgia and neuritis	14	13
Other diseases of nervous system	222	225
Diseases of the ears	7	16
Acute endocarditis	140	105
Organic diseases of heart	2,054	2,426
Angina pectoris	143	171
Diseases of arteries, atheroma, aneurysm, etc.	451	390
Embolism and thrombosis	171	128
Hemorrhage, other diseases of circulatory system	66	64
Bronchitis	278	267
Bronchopneumonia	374	418
Pneumonia	1,606	1,539
Pulmonary congestion	176	116
Asthma	51	57
Other diseases of respiratory system	133	129
Ulcer of stomach	62	69
Other diseases of stomach	294	219
Diarrhoea and enteritis (under 2 years)	419	296
Diarrhoea and enteritis (2 years and more)	248	152
Appendicitis and typhlitis	272	254
Hernia and intestinal obstruction	293	280
Cirrhosis of liver	163	185
Gall stones		39
Other diseases of liver	194	187
Peritonitis	191	110
Other diseases of digestive system	140	124
Acute nephritis and Bright's disease	1,507	1,558
Other diseases of kidneys	72	48
Diseases of the bladder	82	51
Diseases of prostate	85	101
Noncancerous tumors and other diseases of female genital organs	56	79
Puerperal septicaemia	68	67
Other puerperal diseases	135	167
Gangrene	83	69
Other diseases of the skin and annexa	24	19
Diseases of bones and organs of locomotion	43	35
Malformations and injuries at birth	356	400

TABLE NO. 4—Continued

Classification	1914	1915
Premature birth	617	683
Congenital debility, atrophy, marasmus, etc.	379	306
Other causes peculiar to early infancy	124	102
Senility	914	876
Suicide	283	320
Poisoning by food, accident	4	3
Other acute poisonings	47	44
Burns	117	121
Absorption of deleterious gases, suffocation	53	71
Accidental drowning	132	130
Traumation by firearms	61	38
Traumation by cutting or piercing instruments	6	1
Traumation by fall	128	157
Traumation in mines	42	32
Traumation by machines	27	23
Traumation by other crushing	24	10
Railroad accidents	223	213
Streetcar accidents	4	10
Automobile accidents	115	129
Motorcycle accidents	6	3
Injuries by other vehicles	33	51
Injuries by animals	46	22
Starvation	5	
Excessive cold	5	2
Effects of heat	25	1
Other external violence	63	61
Lightning	16	19
Electricity (except lightning)	21	14
Fractures	78	71
Homicide	59	62
Not specified or ill-defined	261	281
Deaths from all other causes		26

TABLE NO. 5—BIRTHS, MARRIAGES AND DIVORCES.

Births Reported for Calendar Years and Marriages and Divorces for Fiscal Years Ending June 30.

County	Births Year 1914		Fiscal Year 1915		Births Year 1915		Fiscal Year 1916	
	Stillbirths	All others	Marriages	Divorces	Stillbirths	All others	Marriages	Divorces
Adair	4	340	106	11	1	306	85	18
Adams		246	103	11		203	92	6
Allamakee	2	345	124	7	2	312	133	6
Appanoose	2	679	293	64	1	645	271	54
Audubon		224	92	4		204	107	6
Benton	6	531	141	26	3	470	162	32
Black Hawk	2	993	566	120	4	708	643	129
Boone	2	337	256	30	2	403	371	37
Bremer	1	239	172	9	1	203	179	5
Buchanan	1	349	169	17	9	319	175	19
Buena Vista	4	334	171	10	4	271	160	10
Butler		344	115	11		334	113	13
Calhoun	1	289	180	16	1	263	156	9
Carroll	4	609	218	10	6	471	199	13
Cass	1	323	193	25	6	309	191	24
Cedar	1	400	161	9	7	321	167	17
Cerro Gordo		609	368	43		621	373	69
Cherokee	5	366	145	13	3	336	158	17
Chickasaw	1	277	131	7	3	300	122	4
Clarke	1	232	130	15	2	199	119	9
Clay		366	167	10	1	246	154	13
Clayton	1	506	209	17	3	391	239	15
Clinton	2	765	303	23	4	660	463	78
Crawford	1	440	180	13	3	448	187	18
Dallas	3	455	214	46	5	455	207	27
Davis		307	109	10	3	233	107	8
Decatur		377	133	14	1	325	143	11
Delaware	2	389	145	11	2	302	163	12
Des Moines	4	614	256	38	9	553	406	64
Dickinson	1	205	71	15	2	181	84	6
Dubuque	1	704	293	37	1	593	618	44
Emmet		246	132	7	1	159	164	9
Fayette	4	588	223	22	3	508	211	18
Floyd		375	145	21	1	307	148	27
Franklin	2	293	120	4	1	247	121	10
Fremont	1	338	98	18	2	256	99	10
Green		414	112	16	1	302	171	16
Grundy	1	354	103	2	3	257	104	10
Guthrie	1	423	150	10	1	309	136	12
Hamilton	1	405	154	22	2	307	164	15
Hancock		300	107	2	2	254	107	5
Hardin	6	360	170	16	4	293	161	26
Harrison	1	307	192	33	1	262	194	23
Henry	2	304	146	19	2	202	135	18
Howard	1	271	101	4		203	129	7
Humboldt	2	203	96	8	2	236	113	9
Ida	3	164	111	5	3	222	109	4
Iowa	2	290	126	15	4	406	130	7
Jackson	4	379	166	15	3	298	184	14
Jasper	2	495	210	22	1	467	253	33
Jefferson	2	308	141	17	1	180	165	12

TABLE NO. 5—Continued County	Births Year 1914		Fiscal Year 1915		Births Year 1915		Fiscal Year 1916	
	Stillbirths	All others	Marriages	Divorces	Stillbirths	All others	Marriages	Divorces
Johnson		481	299	28	6	535	376	28
Jones	2	347	147	17	4	309	182	24
Keokuk	1	307	176	24		408	134	13
Kossuth	12	551	183	19	6	637	180	10
Lee	4	583	448	72	3	610	427	70
Linn	6	1,070	827	170	9	1,131	860	172
Louisa	2	199	73	13	2	243	77	16
Lucas	1	190	146	13	1	121	171	17
Lyon	1	290	136	4		334	113	7
Madison	3	278	111	8	2	324	176	9
Mahaska	4	429	209	32	2	529	250	38
Marion		422	182	27	1	453	179	19
Marshall	3	555	284	49	3	603	302	56
Mills	1	244	118	8	1	204	107	10
Mitchell	6	248	120	9	1	235	130	13
Monona	1	316	102	19	2	430	121	19
Monroe	5	403	216	32	8	587	224	26
Montgomery	1	238	176	21		282	177	18
Muscatine		406	322	64		414	299	63
O'Brien	2	305	130	12	2	430	137	8
Osceola	1	231	101	4	2	229	99	3
Page	5	388	230	32		426	230	37
Palo Alto	2	294	116	13	2	387	119	5
Plymouth	1	457	176	13	2	506	166	9
Pocahontas	3	295	111	4	5	329	90	11
Polk	3	1,759	1,001	596	3	1,717	1,871	479
Pottawattamie	2	765	959	132	1	749	1,013	117
Poweshiek	2	311	101	19	2	399	168	8
Ringgold	1	223	104	9	3	282	122	9
Sac	2	330	132	15	2	435	127	19
Scott	3	921	748	119	3	957	779	100
Shelby	4	349	150	9	2	393	150	14
Sioux	12	659	212	10	5	616	220	4
Story	2	423	220	23		462	199	14
Tama	8	496	188	29	2	494	201	21
Taylor		230	158	10	1	265	119	25
Union	2	367	167	24	1	327	173	21
Van Buren		244	79	9		268	97	5
Wapello	1	529	485	91	3	666	453	87
Warren	1	299	156	5	2	418	178	8
Washington	1	324	160	14	2	374	140	10
Wayne	3	304	124	12	2	290	117	14
Webster	8	743	453	43	5	786	441	57
Winnebago	4	209	96	10	2	300	111	5
Winneshiek	1	329	174	5	2	404	131	5
Woodbury	5	1,416	1,022	246	9	1,397	1,046	302
Worth	1	230	83	5	2	255	69	9
Wright		329	154	16		443	165	11
Total	277	39,877	23,017	3,004	199	44,115	22,609	1,973

TABLE NO. 6—DEATHS FROM TUBERCULOSIS.

Deaths Reported in Iowa from Tuberculosis for Calendar Years 1914 and 1915.

County	1914	1915	County	1914	1915
Adair	6	10	Johnson	22	34
Adams	6	3	Jones	20	9
Allamakee	9	12	Keokuk	15	20
Appanoose	18	25	Kossuth	9	10
Audubon	5	3	Lee	47	38
Benton	15	12	Linn	55	60
Black Hawk	23	24	Louisa	6	9
Boone	18	9	Lucas	4	7
Bremer	6	11	Lyon	4	4
Buchanan	15	22	Madison	7	11
Buena Vista	5	9	Mahaska	27	15
Butler	6	3	Marion	13	17
Calhoun	6	5	Marshall	21	21
Carroll	5	9	Mills	17	25
Cass	3	13	Mitchell	5	4
Cedar	3	10	Monona	3	6
Cerro Gordo	17	10	Monroe	15	18
Cherokee	19	24	Montgomery	7	7
Chickasaw	9	6	Muscatine	18	19
Clarke	5	10	O'Brien	5	5
Clay	5	4	Osceola	4	3
Clayton	12	12	Page	24	17
Clinton	31	14	Palo Alto	11	5
Crawford	4	6	Plymouth	6	9
Dallas	10	13	Pocahontas	6	5
Davis	10	9	Polk	117	98
Decatur	13	8	Pottawattamie	26	30
Delaware	7	4	Poweshiek	10	8
Des Moines	28	17	Ringgold	4	7
Dickinson	1	7	Sac	2	2
Dubuque	54	43	Scott	57	63
Emmet	5	3	Shelby	8	3
Fayette	9	16	Sioux	14	6
Floyd	10	8	Story	14	15
Franklin	8	6	Tama	13	17
Fremont	8	5	Taylor	8	10
Greene	5	4	Union	8	2
Grundy	3	2	Van Buren	6	3
Guthrie	3	9	Wapello	26	34
Hamilton	10	14	Warren	19	9
Hancock	2	5	Washington	8	5
Hardin	9	5	Wayne	3	5
Harrison	5	6	Webster	28	25
Henry	26	19	Winnebago	7	7
Howard	9	9	Winneshiek	13	9
Humboldt	4	9	Woodbury	55	47
Ida	3	3	Worth	7	3
Iowa	10	4	Wright	12	6
Jackson	19	6			
Jasper	19	11	Total	1,372	1,336
Jefferson	7	5			

TABLE NO. 7—DEATHS IN CITIES OF IOWA.

Number of Deaths Reported for Calendar Years from Cities of the First Class.

DEATHS IN BURLINGTON, 1914 AND 1915.

(Exclusive of stillbirths.)

Classification	1914	1915
Total for calendar year	316	342
Males	195	198
Females	121	144
White	306	328
Colored	10	14
Native	229	250
Foreign	93	106
Unknown	14	16
Single	98	86
Married	140	155
Widowed	68	83
Divorced	6	5
Unknown	4	13
Under 1 year	35	22
1 to 5 years	19	6
5 to 10 years	4	2
10 to 20 years	8	10
20 to 30 years	20	18
30 to 40 years	21	29
40 to 50 years	33	36
50 to 60 years	39	32
60 to 70 years	46	49
70 to 80 years	51	53
80 to 90 years	32	47
90 years and over	6	8
Typhoid fever	3	7
Whooping cough	1	1
Diphtheria and croup	2	1
Influenza	1	4
Septicaemia	2	2
Tetanus	1	
Tuberculosis of lungs	19	17
Tuberculous meningitis	1	
Other forms of tuberculosis	2	1
Venereal diseases		
Cancer and other malignant tumors	22	30
Rheumatism	2	2
Diabetes	3	7
Leukaemia	2	
Anaemia, chlorosis	2	3
Other general diseases	2	
Alcoholism	3	1
Simple meningitis	6	1
Cerebrospinal meningitis		1

TABLE NO. 7—Continued

Classification	1914	1915
Locomotor ataxia		2
Cerebral hemorrhage, apoplexy	21	34
Softening of the brain	1	3
Paralysis	1	3
General paralysis of insane	3	
Convulsions of infants	3	
Chorea	1	
Other diseases of nervous system	4	2
Diseases of the ears		2
Acute endocarditis	2	4
Organic diseases of heart	23	40
Angina pectoris	6	4
Diseases of arteries, atheroma, aneurysm, etc.	10	11
Embolism and thrombosis	2	2
Hemorrhage; other diseases of circulatory system	3	1
Bronchitis	7	2
Broncho-pneumonia	2	2
Pneumonia	21	14
Pulmonary congestion	2	
Asthma	1	2
Other diseases of respiratory system	4	
Ulcer of stomach	2	1
Other diseases of stomach	5	2
Diarrhoea and enteritis (under 2 years)	6	9
Diarrhoea and enteritis (2 years and more)	4	
Appendicitis and typhlitis	5	3
Hernia and intestinal obstruction	7	5
Cirrhosis of liver		4
Gallstones		3
Other diseases of liver	3	1
Peritonitis	8	1
Other diseases of digestive system		1
Acute nephritis and Bright's disease	20	25
Other diseases of kidneys	2	1
Diseases of the bladder	1	1
Diseases of prostate	2	2
Non-cancerous tumors and other diseases female genital organs	1	2
Puerperal septicaemia		1
Other puerperal diseases		1
Gangrene	2	2
Diseases of bones and organs of locomotion		1
Malformations and injuries at birth	6	3
Premature birth	7	8
Congenital debility, atrophy, marasmus, etc.	5	5
Other causes peculiar to early infancy	1	1
Senility	13	16
Suicide	4	7
Poisoning by food, accident		1
Other acute poisonings	1	1
Burns		4
Absorption of deleterious gases. Suffocation		3
Accidental drowning	1	3
Traumatism by firearms		1
R. R. accidents		4
Street car accidents		2
Automobile accidents	3	
Effects of heat	1	
Traumatism by fall	2	1
Traumatism in mines		1
Other external violence	1	
Fractures	3	1
Homicide	3	2
Not specified or ill-defined	1	2
Deaths from other causes		4
Stillbirths	13	12

LEATHS IN CEDAR RAPIDS, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	472	485
Males	270	267
Females	202	218
White	460	477
Colored	12	8
Native	336	350
Foreign	127	130
Unknown	9	5
Single	156	147
Married	205	214
Widowed	96	112
Divorced	13	9
Unknown	2	3
Under 1 year	48	50
1 to 5 years	26	15
5 to 10 years	17	12
10 to 20 years	22	17
20 to 30 years	36	41
30 to 40 years	37	46
40 to 50 years	34	59
50 to 60 years	46	59
60 to 70 years	77	72
70 to 80 years	64	64
80 to 90 years	38	41
90 years and over	7	9
Typhoid fever	4	7
Diphtheria and croup	14	6
Influenza		2
Erysipelas		1
Septicaemia	5	5
Tetanus	2	1
Tuberculosis of lungs	37	21
Other forms of tuberculosis	1	2
Venereal diseases		1
Cancer and other malignant tumors	23	46
Rheumatism		4
Diabetes	2	5
Exophthalmic goitre	1	1
Anaemia, chlorosis	5	2
Other general diseases	3	
Alcoholism	4	1
Simple meningitis	7	2
Cerebrospinal meningitis	2	
Locomotor ataxia		2
Acute anterior poliomyelitis	1	
Cerebral hemorrhage; apoplexy	36	35
Softening of the brain	1	2
Paralysis	7	3
General paralysis of insane	1	1
Other forms of mental alienation	2	
Epilepsy		1
Convulsions of infants	2	10
Chorea		1
Other diseases of nervous system	3	1

TABLE NO. 7—Continued

Classification	1914	1915
Diseases of the ears		1
Acute endocarditis	4	2
Organic diseases of heart	49	53
Angina pectoris	6	14
Diseases of arteries, atheroma, aneurysm, etc.	9	5
Hemorrhage; other diseases of circulatory system	4	2
Bronchitis	2	8
Broncho-pneumonia	8	9
Pneumonia	26	30
Pulmonary congestion	4	2
Asthma	1	3
Other diseases of respiratory system		2
Diseases of stomach (except ulcer of stomach)	7	4
Diarrhoea and enteritis (under 2 years)	6	7
Diarrhoea and enteritis (2 years and more)	6	1
Appendicitis and typhlitis	7	13
Hernia and intestinal obstruction	11	7
Cirrhosis of liver	7	7
Gallstones	2	
Other diseases of liver	3	4
Peritonitis	1	4
Other diseases of digestive system	6	3
Acute nephritis and Bright's disease	43	40
Other diseases of kidneys	3	1
Diseases of the bladder	1	1
Diseases of prostate		3
Noncancerous tumors and other diseases female genital organs		1
Puerperal septicaemia	1	3
Other puerperal diseases	2	4
Gangrene	3	
Diseases of bones and organs of locomotion	1	1
Malformations and injuries at birth	8	3
Premature birth	10	13
Congenital debility, atrophy, marasmus, etc.	7	6
Other causes peculiar to early infancy	1	2
Senility	9	9
Suicide	11	14
Acute poisonings, accidental, (except poisoning by food)	1	
Burns	4	1
Absorption of deleterious gases. Suffocation	1	1
Accidental drowning	2	2
Traumatism by firearms	2	1
Traumatism by fall		4
Traumatism by machines	2	1
R. R. accidents	8	13
Street car accidents		2
Automobile accidents	3	1
Injuries by other vehicles		2
Traumatism by other crushing	1	1
Effects of heat	1	
Other external violence	1	1
Electricity (except lightning)	3	
Fractures	3	
Homicide	1	3
Not specified or ill-defined	4	9
Deaths from all other causes	1	1
Stillbirths	16	19

DEATHS IN CLINTON, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	200	226
Males	155	123
Females	105	103
White	257	224
Colored	3	2
Native	156	142
Foreign	94	82
Unknown	10	2
Single	78	66
Married	114	90
Widowed	53	62
Divorced	4	4
Unknown	11	4
Under 1 year	30	28
1 to 5 years	5	11
5 to 10 years	4	
10 to 20 years	7	7
20 to 30 years	20	13
30 to 40 years	23	16
40 to 50 years	24	20
50 to 60 years	45	30
60 to 70 years	29	45
70 to 80 years	44	32
80 to 90 years	25	24
90 years and over	3	6
Unknown	1	
Typhoid fever	4	1
Malarial fever	2	
Measles	1	
Diphtheria and croup		1
Influenza		1
Erysipelas	1	
Septicaemia	2	
Tuberculosis of lungs	15	9
Tuberculosis meningitis	1	
Other forms of tuberculosis	1	
Venereal diseases	1	
Cancer and other malignant tumors	22	16
Diabetes	2	2
Leucheamia	1	
Anaemia, chlorosis	2	3
Other general diseases	4	
Simple meningitis	1	3
Cerebral hemorrhage; apoplexy	12	15
Softening of the brain		3
Paralysis	2	6
General paralysis of insane	2	1
Epilepsy	1	1
Convulsions (nonpuerperal)	1	
Convulsions of infants	1	2
Other diseases of nervous system	1	2
Acute endocarditis	6	
Organic diseases of heart	30	32

TABLE NO. 7—Continued

Classification	1914	1915
Angina pectoris	1	2
Diseases of arteries, atheroma, aneurysm, etc.	2	2
Embolism and thrombosis	4	3
Hemorrhage; other diseases of circulatory system	1	1
Bronchitis	8	3
Bronchopneumonia	6	7
Pneumonia	21	20
Pulmonary congestion	3	3
Other diseases of respiratory system	1	1
Ulcer of stomach	1	1
Other diseases of stomach	2	2
Diarrhoea and enteritis (under 2 years)	2	3
Diarrhoea and enteritis (2 years and more)	2	2
Appendicitis and typhlitis	3	-------
Hernia and intestinal obstruction	1	4
Cirrhosis of liver	2	4
Gallstones	2	-------
Other diseases of liver	1	1
Peritonitis	1	2
Other diseases of digestive system	4	1
Acute nephritis and Bright's disease	16	21
Other diseases of kidneys	1	-------
Diseases of the bladder	2	-------
Puerperal septicaemia	1	-------
Gangrene	1	-------
Malformations and injuries at birth	3	2
Premature birth	11	8
Congenital debility, atrophy, marasmus, etc.	5	8
Other causes peculiar to early infancy	-------	1
Senility	7	7
Suicide	6	3
Acute poisonings, accidental (except poisoning by food)	1	1
Burns	-------	2
Absorption of deleterious gases. Suffocation	-------	1
Accidental drowning	3	4
Traumatism by fall	3	2
R. R. accidents	7	1
Injuries by other vehicles	1	-------
Other external violence	1	-------
Homicide	2	3
Not specified or ill-defined	2	2
Deaths from all other causes	1	-------
Stillbirths	10	14

DEATHS IN COUNCIL BLUFFS, IOWA, FOR 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	406	469
Males	229	252
Females	177	217
White	400	454
Colored	6	15
Native	291	370
Foreign	92	84
Unknown	23	15
Single	145	184
Married	160	170
Widowed	84	100
Divorced	6	5
Unknown	11	10
Under 1 year	54	69
1 to 5 years	28	20
5 to 10 years	13	13
10 to 20 years	13	26
20 to 30 years	26	33
30 to 40 years	35	32
40 to 50 years	39	42
50 to 60 years	42	47
60 to 70 years	60	59
70 to 80 years	62	90
80 to 90 years	26	41
90 years and over	7	6
Typhoid fever	9	3
Malarial fever	1	-------
Smallpox	1	1
Measles	-------	3
Scarlet fever	2	1
Whooping cough	3	5
Diphtheria and croup	10	4
Influenza	2	6
Septicaemia	9	1
Tetanus	1	2
Tuberculosis of lungs	16	15
Tuberculous meningitis	1	-------
Pott's disease	1	3
Other forms of tuberculosis	2	5
Venereal diseases	1	4
Cancer and other malignant tumors	24	27
Rheumatism	1	3
Diabetes	2	8
Leuchaemia	-------	2
Anaemia, chlorosis	1	3
Other general diseases	3	5
Alcoholism	1	-------
Simple meningitis	3	1
Cerebrospinal meningitis	2	-------
Cerebral hemorrhage, apoplexy	30	23
Paralysis	3	8
General paralysis of insane	3	3
Other forms of mental alienation	-------	3
Epilepsy	3	-------
Convulsions (nonpuerperal)	2	-------

TABLE NO. 7—Continued

Classification	1914	1915
Convulsions of infants	1	
Neuralgia and neuritis	1	
Other diseases of nervous system	4	5
Acute endocarditis	3	6
Organic diseases of heart	37	42
Angina pectoris	1	2
Diseases of arteries, atheroma, aneurysm, etc.	6	11
Embolism and thrombosis	5	9
Hemorrhage; other diseases of circulatory system		3
Bronchitis	1	2
Bronchopneumonia	6	4
Pneumonia	27	40
Pulmonary congestion	3	7
Other diseases of respiratory system	2	4
Ulcer of stomach	1	2
Other diseases of stomach	3	1
Diarrhoea and enteritis (under 2 years)	10	10
Diarrhoea and enteritis (2 years and more)	5	4
Appendicitis and typhlitis	4	5
Hernia and intestinal obstruction	6	7
Cirrhosis of liver	4	6
Gallstones		1
Other diseases of liver	6	5
Peritonitis	6	3
Other diseases of digestive system	3	4
Acute nephritis and Bright's disease	38	42
Other diseases of kidneys	1	1
Diseases of the bladder	1	1
Diseases of prostate		2
Noncancerous tumors and other diseases female genital organs	1	6
Puerperal septicaemia		1
Other puerperal diseases	5	3
Gangrene	1	2
Other diseases of the skin and annexa	1	1
Diseases of bones and organs of locomotion	1	1
Malformation and injuries at birth	8	8
Premature birth	9	15
Congenital debility, atrophy, marasmus, etc.	9	8
Other causes peculiar to early infancy	1	1
Senility	12	12
Suicide	8	7
Acute poisonings, accidental, (except poisoning by food)	1	1
Burns	2	1
Absorption of deleterious gases. Suffocation	1	3
Accidental drowning		2
Traumatism by firearms		2
Traumatism by cutting or piercing instruments	1	
Traumatism by fall	1	2
R. R. accidents	12	11
Automobile accidents		2
Injuries by other vehicles		2
Injuries by animals	1	2
Excessive cold	1	
Other external violence		2
Fractures	2	2
Homicide	2	3
Not specified or ill-defined	6	3
Stillbirth	30	24

DEATHS IN DAVENPORT, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	613	679
Males	352	384
Females	261	295
White	601	663
Colored	12	16
Native	374	424
Foreign	220	239
Unknown	19	16
Single	172	256
Married	269	234
Widowed	152	172
Divorced	6	7
Unknown	14	10
Under 1 year	66	72
1 to 5 years	13	29
5 to 10 years	6	15
10 to 20 years	16	19
20 to 30 years	59	73
30 to 40 years	59	53
40 to 50 years	58	64
50 to 60 years	75	90
60 to 70 years	84	78
70 to 80 years	113	108
80 to 90 years	64	65
90 years and over	6	13
Unknown	1	
Typhoid fever	7	3
Measles		4
Scarlet fever		1
Whooping cough	1	7
Diphtheria and croup	3	2
Influenza	2	
Erysipelas	1	1
Septicaemia	7	4
Tetanus	1	1
Tuberculosis of lungs	44	70
Tuberculous meningitis	2	2
Pott's disease	1	
Other forms of tuberculosis	3	5
Venereal diseases	1	3
Cancer and other malignant tumors	39	48
Rhumatism	1	4
Diabetes	9	11
Exophthalmic goitre		1
Leuchaemia		4
Anaemia, chlorosis	2	5
Other general diseases	2	2
Alcoholism	4	2
Simple meningitis	5	5
Cerebrospinal meningitis	1	
Locomotor ataxia		1
Cerebral hemorrhage; apoplexy	53	39
Softening of the brain	1	
Paralysis	5	
General paralysis of insane	2	

TABLE NO. 7—Continued

Classification	1914	1915
Other forms of mental alienation	3	3
Epilepsy	1	7
Convulsions of infants	4	4
Other diseases of the nervous system	4	7
Diseases of the ears		1
Acute endocarditis	9	
Organic diseases of heart	67	91
Angina pectoris	2	
Diseases of arteries, atheroma, aneurysm, etc.	22	16
Embolism and thrombosis	4	6
Hemorrhage; other diseases of circulatory system		1
Bronchitis	8	8
Bronchopneumonia	13	19
Pneumonia	35	38
Pulmonary congestion	5	5
Asthma	2	
Other diseases of respiratory system	9	5
Ulcer of stomach	4	4
Other diseases of stomach	11	6
Diarrhoea and enteritis (under 2 years)	6	3
Diarrhoea and enteritis (2 years and more)	2	4
Appendicitis and typhlitis	7	8
Hernia and intestinal obstruction	4	10
Cirrhosis of liver	9	13
Gallstones	1	2
Other diseases of liver	4	3
Peritonitis	1	4
Other diseases of digestive system	1	3
Acute nephritis and Bright's disease	22	34
Other diseases of kidneys	3	2
Diseases of the bladder	2	2
Diseases of prostate		3
Nonmalignant tumors and other diseases female genital organs	2	
Puerperal septicaemia	2	5
Other puerperal diseases	8	6
Gangrene	1	1
Diseases of bones and organs of locomotion		2
Malformations and injuries at birth	8	16
Premature birth	18	24
Congenital debility, atrophy, marasmus, etc.	5	5
Other causes peculiar to early infancy	4	7
Senility	15	13
Suicide	20	27
Acute poisonings, accidental, (except poisoning by food)	2	3
Burns	1	4
Absorption of deleterious gases. Suffocation	2	2
Accidental drowning	2	4
Traumatism by fall	7	9
R. R. accidents	4	6
Street car accidents		1
Automobile accidents	1	6
Motorcycle accidents	1	
Injuries by other vehicles		1
Injuries by animals	1	
Other external violence	2	
Electricity (except lightning)	1	
Fractures	5	4
Homicide	2	3
Not specified or ill-defined	27	28
Stillbirths	**6**	**3**

DEATHS IN DES MOINES, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	1,284	1,213
Males	734	656
Females	550	557
White	1,213	1,177
Colored	71	36
Native	1,099	1,047
Foreign	180	180
Unknown	26	26
Single	435	410
Married	521	518
Widowed	242	253
Divorced	37	17
Unknown	19	16
Under 1 year	191	193
1 to 5 years	46	44
5 to 10 years	26	26
10 to 20 years	56	43
20 to 30 years	135	96
30 to 40 years	113	113
40 to 50 years	131	114
50 to 60 years	163	146
60 to 70 years	194	168
70 to 80 years	141	108
80 to 90 years	79	87
90 years and over	9	18
Unknown	1	
Typhoid fever	12	20
Malaria fever		1
Smallpox		1
Measles	1	7
Scarlet fever	5	1
Whooping cough	2	6
Diphtheria and croup	15	10
Influenza	1	10
Erysipelas	4	3
Septicaemia	13	12
Rabies		1
Pellagra		1
Tetanus	4	3
Tuberculosis of lungs	80	69
Tuberculous meningitis	2	2
Other forms of tuberculosis	12	10
Venereal diseases	3	9
Cancer and other malignant tumors	89	98
Rheumatism	3	5
Diabetes	18	13
Exophthalmic goitre	1	3
Leukaemia	1	6
Anaemia, chlorosis	11	7
Other general diseases	6	8
Alcoholism	4	4
Simple meningitis	13	11
Cerebrospinal meningitis	3	1
Locomotor ataxia		3
Acute anterior poliomyelitis		1
Cerebral hemorrhage, apoplexy	74	73
Softening of the brain	2	7
Paralysis	11	13

TABLE NO. 7—Continued

Classification	1914	1915
General paralysis of insane	4	2
Other forms of mental alienation	4	2
Epilepsy	3	4
Convulsions of infants	1	4
Chorea	2	
Neuralgia and neuritis	2	2
Other diseases of nervous system	17	9
Diseases of the ears	1	2
Acute endocarditis	11	6
Organic diseases of heart	131	116
Angina pectoris	2	6
Diseases of arteries, atheroma, aneurysm, etc.	17	15
Embolism and thrombosis	13	7
Hemorrhage; other diseases of circulatory system	6	2
Bronchitis	7	13
Bronchopneumonia	25	16
Pneumonia	97	87
Pulmonary congestion	12	7
Asthma	4	3
Other diseases of respiratory system	7	6
Ulcer of stomach	9	4
Other diseases of stomach	13	9
Diarrhoea and enteritis (under 2 years)	16	29
Diarrhoea and enteritis (2 years and more)	9	8
Appendicitis and typhlitis	22	21
Hernia and intestinal obstruction	23	18
Cirrhosis of liver	10	11
Gallstones	3	7
Other diseases of liver	10	8
Peritonitis	7	4
Other diseases of digestive system	9	5
Acute nephritis and Bright's disease	54	75
Other diseases of kidneys	7	2
Diseases of the bladder	13	
Diseases of prostate	5	5
Noncancerous tumors and other diseases female genital organs	7	9
Puerperal septicaemia	12	3
Other puerperal diseases	8	12
Gangrene	3	4
Other diseases of the skin and annexa	1	1
Diseases of bones and organs of locomotion	5	3
Malformations and injuries at birth	23	26
Premature birth	63	48
Congenital debility, atrophy, marasmus, etc.	22	22
Other causes peculiar to early infancy	9	5
Senility	33	35
Suicide	19	13
Acute poisonings, acidental, except poisoning by food	1	2
Burns	4	6
Absorption of deleterious gases. Suffocation	7	8
Accidental drowning	5	9
Traumatism by firearms	4	1
Traumatism by fall	5	11
Traumatism in mines	6	9
Traumatism by machines	3	2
R. R. accidents	16	14
Street car accidents	1	1
Automobile accidents	8	8
Injuries by other vehicles	1	2
Injuries by animals	3	1
Traumatism by other crushing	2	1
Effects of heat	4	
Other external violence	3	6
Lightning		2
Electricity (except lightning)	2	
Fractures	8	5
Homicide	8	5
Not specified or ill-defined	16	6
Deaths from all other causes	4	1
Stillbirths	59	90

DEATHS IN DUBUQUE, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	481	480
Males	262	271
Females	219	209
White	480	479
Colored	1	1
Native	303	280
Foreign	167	191
Unknown	11	9
Single	179	171
Married	188	173
Widowed	104	130
Divorced	3	4
Unknown	7	2
Under 1 year	46	59
1 to 5 years	20	16
5 to 10 years	5	1
10 to 20 years	18	9
20 to 30 years	41	27
30 to 40 years	40	33
40 to 50 years	46	42
50 to 60 years	64	71
60 to 70 years	55	69
70 to 80 years	79	80
80 to 90 years	45	58
90 years and over	12	9
Typhoid fever	7	9
Malarial fever	1	
Measles	1	
Scarlet fever	1	
Whooping cough	1	1
Diphtheria and croup	10	1
Influenza	2	8
Erysipelas	1	2
Septicaemia	4	1
Tuberculosis of lungs	46	32
Other forms of tuberculosis	5	3
Venereal diseases	1	1
Cancer and other malignant tumors	41	31
Rheumatism	1	3
Diabetes	3	12
Exophthalmic goitre		1
Anaemia, chlorosis	2	2
Other general diseases	1	
Alcoholism	1	
Simple meningitis	13	8
Cerebrospinal meningitis	1	1
Acute anterior poliomyelitis	2	
Cerebral hemorrhage; apoplexy	40	49
Softening of the brain	1	1
Paralysis	13	6
General paralysis of insane	3	1
Other forms of mental alienation	2	
Epilepsy	1	1
Convulsions of infants		5

TABLE NO. 7—Continued

Classification	1914	1915
Other diseases of nervous system	5	4
Acute endocarditis	2	2
Organic diseases of heart	50	44
Angina pectoris	1	1
Diseases of arteries, atheroma, aneurysm, etc.	7	14
Embolism and thrombosis	2	
Hemorrhage; other diseases of circulatory system	2	1
Bronchitis	5	14
Bronchopneumonia	4	13
Pneumonia	23	28
Pulmonary congestion	2	
Asthma		1
Other diseases of respiratory system	4	3
Ulcer of stomach	1	1
Other diseases of stomach	8	6
Diarrhoea and enteritis (under 2 years)	20	4
Diarrhoea and enteritis (2 years and more)	14	3
Appendicitis and typhlitis	10	1
Hernia and intestinal obstruction	6	7
Cirrhosis of liver	5	4
Gallstones		1
Other diseases of liver	3	2
Peritonitis	6	4
Other diseases of digestive system		1
Acute nephritis and Bright's disease	22	19
Other diseases of kidneys		1
Diseases of the bladder	2	1
Diseases of prostate	2	1
Noncancerous tumors and other diseases female genital organs		2
Puerperal septicaemia	2	2
Other puerperal diseases	5	2
Gangrene	4	2
Other diseases of the skin and annexa		1
Diseases of bones and organs of locomotion	1	
Malformations and injuries at birth	7	9
Premature birth	15	17
Congenital debility, atrophy, marasmus, etc.	5	11
Other causes peculiar to early infancy	1	1
Senility	17	17
Suicide	3	2
Acute poisonings, accidental, (except poisoning by food)	1	2
Burns		1
Absorption of deleterious gases. Suffocation		1
Accidental drowning	1	4
Traumatism by fire arms	1	
Traumatism by cutting or piercing instruments	1	
Traumatism by fall	1	2
Traumatism by machines	1	
R. R. accidents	2	3
Street car accidents	1	1
Automobile accidents	1	2
Injuries by other vehicles	1	
Effects of heat	1	
Other external violence	2	1
Lightning	1	
Fractures		1
Homicide	1	1
Not specified or ill-defined	2	3
Deaths from all other causes	2	1
Stillbirths	11	16

DEATHS IN FORT DODGE, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total	221	168
Males	113	99
Females	108	69
White	217	167
Colored	4	1
Native	171	120
Foreign	47	46
Unknown	3	2
Single	98	72
Married	89	65
Widowed	28	27
Divorced	6	
Unknown		4
Under 1 year	49	21
1 to 5 years	8	16
5 to 10 years	2	5
10 to 20 years	5	3
20 to 30 years	29	13
30 to 40 years	27	15
40 to 50 years	25	18
50 to 60 years	23	15
60 to 70 years	17	26
70 to 80 years	22	26
80 to 90 years	13	8
90 years and over	1	3
Typhoid fever	3	1
Measles		1
Whooping cough	2	1
Diphtheria and croup	2	4
Septicaemia	3	4
Tetanus	1	
Tuberculosis of lungs	17	12
Tuberculous meningitis	1	
Other forms of tuberculosis	1	
Cancer and other malignant tumors	12	10
Rheumatism		2
Diabetes		4
Exophthalmic goitre		1
Anaemia, chlorsis	1	
Other general diseases	5	
Alcoholism	2	4
Cerebral hemorrhage, apoplexy	12	12
Epilepsy		1
Convulsions of infants	2	
Other diseases of nervous system	3	2
Diseases of the ears		1
Acute endocarditis	2	2
Organic diseases of heart	21	17
Angina pectoris	1	1
Diseases of arteries, atheroma, aneurysm, etc.	5	4
Embolism and thrombosis	1	
Hemorrhage; other diseases of circulatory system		1
Bronchitis	1	1
Bronchopneumonia	19	9
Pneumonia	19	9

TABLE NO. 7—Continued

Classification	1914	1915
Pulmonary congestion	1	1
Asthma	2	2
Other diseases of respiratory system	1	1
Diseases of stomach (except ulcer of stomach)	1	1
Diarrhoea and enteritis (under 2 years)	8	5
Diarrhoea and enteritis (2 years and more)	1	2
Appendicitis and typhlitis	6	5
Hernia and intestinal obstruction	6	6
Cirrhosis of liver	1	2
Gallstones		1
Other diseases of liver	3	1
Peritonitis	2	
Other diseases of digestive system		2
Acute nephritis and Bright's disease	10	6
Other diseases of kidneys		1
Noncancerous tumors and other diseases female genital organs	1	1
Puerperal diseases (except puerperal septicaemia)	1	
Gangrene	1	1
Diseases of bones and organs of locomotion	1	
Malformation and injuries at birth	4	3
Premature birth	8	3
Congenital debility, atrophy, marasmus, etc.	8	4
Senility	7	4
Suicide	1	
Acute poisonings, accidental, (except poisoning by food)	1	
Absorption of deleterious gases. Suffocation	1	
Accidental drowning	1	
Traumatism by fall	3	5
Traumatism in mines		2
R. R. accidents	8	3
Automobile accidents	2	3
Injuries by other vehicles	1	
Other external violence	2	
Electricity (except lightning)	1	
Homicide	1	2
Not specified or ill-defined	2	1
Deaths from all other causes		1
Stillbirths	3	4

DEATHS IN KEOKUK, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total	236	231
Males	125	110
Females	111	121
White	212	203
Colored	24	28
Native	180	181
Foreign	41	46
Unknown	15	4
Single	82	75
Married	81	84
Widowed	61	69
Divorced	2	2
Unknown	10	1
Under 1 year	30	20
1 to 5 years	21	11
5 to 10 years	2	
10 to 20 years	5	10
20 to 30 years	20	15
30 to 40 years	14	21
40 to 50 years	22	27
50 to 60 years	27	25
60 to 70 years	31	30
70 to 80 years	35	41
80 to 90 years	23	27
90 years and over	4	4
Unknown	2	
Typhoid fever	4	2
Whooping cough	4	4
Influenza	1	6
Erysipelas		2
Septicaemia	3	2
Tetanus		1
Tuberculosis of lungs	27	20
Tuberculous meningitis	2	1
Pott's disease		1
Other forms of tuberculosis	1	3
Cancer and other malignant tumors	10	20
Diabetes	1	4
Other general diseases	6	
Alcoholism		3
Simple meningitis	2	1
Cerebrospinal meningitis		1
Acute anterior poliomyelitis	2	
Cerebral hemorrhage; apoplexy	13	11
Softening of the brain	3	2
Paralysis	6	7
Other forms of mental alienation	1	
Epilepsy		1
Convulsions of infants	1	
Neuralgia and neuritis	1	
Other diseases of nervous system		1
Acute endocarditis	3	3
Organic diseases of heart	17	18
Angina pectoris	2	
Embolism and thrombosis	4	2

TABLE NO. 7—Continued

Classification	1914	1915
Bronchitis	3	2
Bronchopneumonia	2	2
Pneumonia	16	13
Pulmonary congestion	1	
Asthma		1
Other diseases of respiratory system	1	6
Ulcer of stomach	2	
Other diseases of stomach	2	4
Diarrhoea and enteritis (under 2 years)	5	1
Diarrhoea and enteritis (2 years and more)	2	5
Appendicitis and typhlitis	5	6
Hernia and intestinal obstruction	6	7
Gallstones	2	3
Cirrhosis of liver		1
Other diseases of liver	4	3
Peritonitis	1	1
Other diseases of digestive system	2	2
Acute nephritis and Bright's disease	17	12
Other diseases of kidneys	1	2
Diseases of prostate	1	3
Noncancerous tumors and other diseases female genital organs	2	2
Puerperal disease (except puerperal septicaemia)		1
Gangrene	2	
Malformations and injuries at birth	2	2
Premature birth	10	8
Congenital debility, atrophy, marasmus, etc.	5	
Senility	10	8
Suicide	3	3
Acute poisonings, accidental, (except poisoning by food)		2
Burns	1	2
Absorption of deleterious gases. Suffocation	1	1
Accidental drowning		2
Traumatism by fall		1
R. R. accidents	1	2
Automobile accidents	2	2
Injuries by animals	1	
Other external violence	1	
Electricity (except lightning)		1
Homicide	1	1
Not specified or ill-defined	7	3
Deaths from all other causes	1	
Stillbirths	13	5

*DEATHS IN MARSHALLTOWN, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total	323	293
Males	199	174
Females	124	119
White	322	290
Colored	1	3
Native	262	240
Foreign	47	39
Unknown	14	14
Single	79	72
Married	117	115
Widowed	104	95
Divorced	13	6
Unknown	10	5
Under 1 year	37	21
1 to 5 years	6	5
5 to 10 years	2	8
10 to 20 years	4	12
20 to 30 years	11	10
30 to 40 years	18	8
40 to 50 years	17	20
50 to 60 years	31	24
60 to 70 years	49	53
70 to 80 years	96	85
80 to 90 years	45	37
90 years and over	6	10
Unknown	1	
Typhoid fever		2
Diphtheria and croup		8
Influenza	3	5
Erysipelas	1	2
Septicaemia	4	3
Tetanus		1
Tuberculosis of lungs	10	10
Tuberculous meningitis	1	
Other forms of tuberculosis	2	3
Venereal diseases	2	
Cancer and other malignant tumors	23	22
Rheumatism	2	4
Diabetes	2	5
Exopthalmic goitre		1
Luchaemia	1	
Anaemia, chlorosis	4	2
Other general diseases	3	2
Alcoholism	1	3
Simple meningitis	2	
Cerebral hemorrhage; apoplexy	23	21
Softening of the brain	1	1
Paralysis	13	11
General paralysis of insane	2	
Other forms of mental alienation	1	
Epilepsy		2
Convulsions of infants	2	1
Other diseases of nervous system	2	7
Acute endocarditis		1
Organic diseases of heart	45	36

TABLE NO. 7—Continued

Classification	1914	1915
Angina pectoris		1
Diseases or arteries, atheroma, aneurysm, etc.	1	2
Embolism and thrombosis	1	2
Hemorrhage; other diseases of circulatory system	1	1
Bronchitis	3	2
Bronchopneumonia	4	3
Pneumonia	27	19
Pulmonary congestion	1	2
Asthma	1	
Ulcer of stomach	4	1
Other diseases of stomach	6	4
Diarrhoea and enteritis (under 2 years)	7	1
Diarrhoea and enteritis (2 years and more)	1	3
Appendicitis and typhlitis	5	6
Hernia and intestinal obstruction	2	1
Cirrhosis of liver	7	4
Other diseases of liver	4	
Peritonitis	3	1
Other diseases of digestive system		2
Acute nephritis and Bright's disease	31	27
Diseases of the bladder	4	
Diseases of prostate		2
Noncancerous tumors and other diseases female genital organs		4
Puerperal septicaemia		1
Other puerperal diseases	2	1
Gangrene	4	1
Malformations and injuries at birth	5	4
Premature birth	9	4
Congenital debility, atrophy, marasmus, etc.	4	4
Other causes peculiar to early infancy		1
Senility	12	11
Suicide	7	1
Burns	2	1
Accidental drowning		1
Traumatism by fall	5	2
R. R. accidents	7	1
Motorcycle accidents	1	
Fractures	1	1
Homicide		2
Not specified or ill-defined	1	3
Deaths from all other causes		3
Stillbirths	13	5

*Of the deaths in Marshalltown during 1914, 91 of the males and 27 of the females died in the Iowa Soldiers' Home and of the deaths in Marshalltown during 1915, 78 of the males and 24 of the females died in the Iowa Soldiers' Home.

DEATHS IN MASON CITY, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	164	200
Males	96	109
Females	68	91
White	159	193
Colored	5	7
Native	123	144
Foreign	37	51
Unknown	4	5
Single	77	71
Married	51	79
Widowed	30	41
Divorced	2	4
Unknown	4	5
Under 1 year	39	40
1 to 5 years	10	5
5 to 10 years	4	1
10 to 20 years	7	7
20 to 30 years	13	20
30 to 40 years	13	18
40 to 50 years	13	13
50 to 60 years	15	24
60 to 70 years	14	30
70 to 80 years	20	25
80 to 90 years	11	15
90 years and over	6	2
Typhoid fever	2	4
Influenza		8
Septicaemia	1	3
Tetanus	1	
Tuberculosis of lungs	8	5
Other forms of tuberculosis		2
Venereal diseases	1	1
Cancer and other malignant tumors	10	11
Rheumatism		3
Diabetes		4
Leuchaemia		2
Anaemia, chlorosis	1	1
Other general diseases	2	
Simple meningitis	2	1
Locomotor ataxia		1
Cerebral hemorrhage; apoplexy	10	9
Paralysis	2	5
General paralysis of insane		
Other forms of mental alienation		1
Convulsions (non-puerperal)	1	
Convulsions of infants	2	2
Other diseases of nervous system	1	
Acute endocarditis	1	1
Organic diseases of heart	13	21
Angina pectoris	1	
Diseases of arteries, atheroma, aneurysm, etc.	4	6
Embolism and thrombosis		2
Bronchitis	3	3
Bronchopneumonia	4	3

TABLE NO. 7—Continued

Classification	1914	1915
Pneumonia	12	17
Pulmonary congestion	1	
Asthma	1	
Other diseases of respiratory system	1	
Ulcer of stomach	1	2
Other diseases of stomach		1
Diarrhoea and enteritis (under 2 years old)	9	8
Diarrroea and enteritis (2 years and more)	2	2
Appendicitis and typhlitis	3	4
Hernia and intestinal obstruction		3
Gallstones		1
Other diseases of liver	2	1
Peritonitis	1	
Other diseases of digestive system		1
Acute nephritis and Bright's disease	10	13
Other diseases of kidneys	1	
Diseases of the bladder		1
Diseases of prostate		2
Noncancerous tumors and other diseases female genital organs		2
Puerperal septicaemia	2	
Other puerperal diseases		4
Diseases of bones and organs of locomotion		1
Malformations and injuries at birth	3	2
Premature birth	5	10
Congenital debility, atrophy, marasmus, etc.	8	4
Other causes peculiar to early infancy	1	1
Senility	5	1
Suicide	5	2
Burns	2	5
Absorption of deleterious gases. Suffocation	2	
Accidental drowning	2	1
Traumatism by firearms	1	
Traumatism by fall	3	1
Traumatism by machines	1	
R. R. accidents	1	3
Automobile accidents	2	1
Injuries by other vehicles		1
Traumatism by other crushing	1	
Other external violence	2	
Electricity (except lightning)	1	1
Homicide	1	4
Not specified or ill-defined	2	1
Stillbirths	7	14

DEATHS IN MUSCATINE, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	201	236
Males	109	122
Females	92	114
White	198	236
Colored	3	
Native	142	173
Foreign	58	61
Unknown	1	2
Single	52	75
Married	96	91
Widowed	50	66
Divorced	1	3
Unknown	2	1
Under 1 year	20	23
1 to 5 years	11	6
5 to 10 years		1
10 to 20 years	4	12
20 to 30 years	20	19
30 to 40 years	10	19
40 to 50 years	17	10
50 to 60 years	18	29
60 to 70 years	34	29
70 to 80 years	34	55
80 to 90 years	28	29
90 years and over	4	4
Unknown	1	
Typhoid fever	4	6
Whooping cough		5
Diphtheria and croup	1	2
Influenza	2	4
Septicaemia	3	
Tetanus		1
Tuberculosis of lungs	11	11
Tuberculous meningitis	2	2
Pott's disease		1
Other forms of tuberculosis	3	
Venereal diseases		1
Cancer and other malignant tumors	6	19
Rheumatism		1
Diabetes	3	2
Leuchaemia		1
Anaemia, chlorsis		2
Other general diseases	3	
Simple meningitis	1	2
Locomotor ataxia	2	2
Cerebral hemorrhage; apoplexy	21	18
Softening of the brain		1
Paralysis	5	5
Convulsions of infants	2	
Other diseases of nervous system	2	3
Diseases of the ears		1
Acute endocarditis		1
Organic diseases of heart	17	20
Angina pectoris	2	
Diseases of arteries, atheroma, aneurysm, etc.		4

TABLE NO. 7—Continued

Classification	1914	1915
Embolism and thrombosis		3
Hemorrhage; other diseases of circulatory system	3	
Bronchitis	2	1
Bronchopneumonia	2	1
Pneumonia	13	11
Pulmonary congestion	2	
Other diseases of respiratory system	1	1
Ulcer of stomach	2	
Other diseases of stomach	4	2
Diarrhoea and enteritis (under 2 years)	1	3
Diarrhoea and enteritis (2 years and more)	1	
Appendicitis and typhlitis	2	3
Hernia and intestinal obstruction	1	1
Cirrhosis of liver	5	3
Gallstones		1
Other diseases of liver	2	1
Peritonitis	4	2
Other diseases of digestive system	1	3
Acute nephritis and Bright's disease	15	14
Other diseases of kidneys	1	2
Diseases of the bladder	1	1
Disease of prostate		2
Noncancerous tumors and other diseases female genital organs		1
Puerperal septicaemia	1	1
Other puerperal diseases		2
Gangrene		2
Malformations and injuries at birth	4	1
Premature birth	6	9
Congenital debility, atrophy, marasmus, etc.	3	4
Other causes peculiar to early infancy		1
Senility	18	24
Suicide	3	3
Burns	1	2
Absorption of deleterious gases. Suffocation		1
Accidental drowning	2	1
Traumatism by fall	4	3
Traumatism by machines		1
R. R. accidents	1	1
Traumatism by other crushing	1	
Other external violence		4
Electricity (except lightning)		1
Fractures	1	1
Homicide	1	
Not specified or ill-defined	2	1
Deaths from all other causes		1
Stillbirths	6	8

DEATHS IN OTTUMWA, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	291	327
Males	151	185
Females	140	154
White	286	293
Colored	5	14
Native	264	273
Foreign	28	44
Unknown	9	20
Single	97	111
Married	137	129
Widowed	59	76
Divorced	2	10
Unknown	6	11
Under 1 year	35	45
1 to 5 years	15	19
5 to 10 years	5	5
10 to 20 years	13	11
20 to 30 years	25	20
30 to 40 years	18	33
40 to 50 years	26	29
50 to 60 years	31	30
60 to 70 years	46	63
70 to 80 years	44	60
80 to 90 years	30	26
90 years and over	1	5
Unknown	2	
Typhoid fever	3	5
Smallpox		1
Measles		6
Scarlet fever	1	
Whooping cough	1	3
Diphtheria and croup		3
Influenza	1	7
Erysipelas	2	
Septicaemia	2	6
Pellagra	1	1
Tetanus	1	
Tuberculosis of lungs	17	21
Tuberculous meningitis	2	3
Other forms of tuberculosis	6	4
Cancer and other malignant tumors	25	31
Rheumatism	1	
Diabetes	3	3
Exophthalmic goitre	1	
Anaemia, chlorsis	2	1
Other general diseases	3	
Alcoholism	2	
Simple meningitis	1	
Acute anterior poliomyelitis		1
Cerebral hemorrhage, apoplexy	20	21
Softening of the brain		1
Paralysis	5	1
General paralysis of insane		1
Epilepsy		3

TABLE NO. 7—Continued

Classification	1914	1915
Neuralgia and neuritis	1	
Other diseases of nervous system	4	4
Acute endocarditis	1	
Organic diseases of heart	24	19
Angina peteoris	3	4
Diseases of arteries, atheroma, aneurysm, etc.	5	3
Embolism and thrombosis	3	1
Hemorrhage; other diseases of circulatory system	2	2
Bronchitis	2	4
Bronchopneumonia	8	5
Pneumonia	28	24
Pulmonary congestion	1	
Asthma	1	1
Other diseases of respiratory system		2
Ulcer of stomach		1
Other diseases of stomach	6	
Diarrhoea and enteritis (under 2 years)	3	3
Diarrhoea and enteritis (2 years and more)	1	2
Appendicitis and typhlitis	1	9
Hernia and intestinal obstruction	2	2
Cirrhosis of liver	1	
Gallstones	1	1
Other diseases of liver	1	2
Peritonitis		2
Other diseases of digestive system	4	1
Acute nephritis and Bright's disease	21	37
Other dieases of kidneys		1
Diseases of the bladder		1
Diseases of prostate		3
Noneancerous tumors and other diseases female genital organs	1	1
Puerperal septicaemia		4
Other puerperal diseases	1	1
Gangrene		2
Malformations and injuries at birth	5	2
Premature birth	5	15
Congenital debility, atrophy, marasmus, etc.	8	4
Other causes peculiar to early infancy		4
Senility	15	11
Suicide	5	4
Burns	3	1
Absorption of deleterious gases. Suffocation	1	1
Accidental drowning	3	3
Traumatism by firearms	1	
Traumatism by fall	1	2
Tramatism in mines	3	1
Traumatism by machines		1
R. R. accidents	8	4
Automobile accidents	3	3
Injuries by other vehicles		1
Effects of heat	1	
Other external violence		1
Electricity (except lightning)		1
Fractures		1
Homicide	3	1
Not specified or ill-defined	1	12
Deaths from all other causes		1
Stillbirths	8	13

DEATHS IN SIOUX CITY, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Classification	1914	1915
Total for calendar year	714	654
Males	432	392
Females	282	262
White	704	645
Colored	10	9
Native	517	461
Foreign	158	179
Unknown	39	24
Single	305	279
Married	277	241
Widowed	99	105
Divorced	7	12
Unknown	26	17
Under 1 year	129	129
1 to 5 years	38	43
5 to 10 years	20	12
10 to 20 years	30	27
20 to 30 years	79	48
30 to 40 years	78	56
40 to 50 years	92	68
50 to 60 years	91	90
60 to 70 years	65	74
70 to 80 years	68	63
80 to 90 years	20	40
90 years and over	3	4
Unknown	1	
Typhoid fever	6	4
Measles	2	4
Whooping cough	1	6
Diphtheria and croup	3	9
Influenza	3	2
Erysipelas	2	2
Septicaemia	14	8
Tetanus	3	2
Tuberculosis of lungs	36	34
Tuberculous meningitis	4	3
Pott's disease	1	
Other forms of tuberculosis	7	2
Venereal diseases	3	4
Cancer and other malignant tumors	41	48
Rheumatism	4	1
Diabetes	13	9
Exopthalmic goitre	1	1
Leuchaemia	3	1
Anaemia, chlorosis	3	6
Other general diseases	5	5
Alcoholism	7	2
Chronic occupation poisonings		1
Simple meningitis	7	2
Cerebrospinal meningitis		3
Locomotor ataxia		1
Cerebral hemorrhage, apoplexy	41	32
Softening of the brain	1	
Paralysis	1	

TABLE NO. 7—Continued

Cassification	1914	1915
General paralysis of insane		2
Epilepsy		3
Convulsions of infants	6	7
Neuralgia and neuritis		1
Other disease of nervous system	3	7
Acute endocarditis	7	5
Organic diseases of heart	31	39
Diseases of arteries, atheroma, aneurysm, etc.	17	9
Embolism and thrombosis	12	5
Hemorrhage; other diseases of circulatory system	4	2
Bronchitis	5	1
Bronchopneumonia	20	17
Pneumonia	51	58
Pulmonary congestion	1	4
Asthma	1	
Other diseases of respiratory system	7	2
Ulcer of stomach	3	7
Other diseases of stomach	9	10
Diarrhoea and enteritis (under 2 years)	30	16
Diarrhoea and enteritis (2 years and more)	5	7
Appendicitis and typhlitis	38	17
Hernia and intestinal obstruction	11	11
Cirrhosis of liver	5	6
Gallstones		5
Other diseases of liver	4	5
Peritonitis	4	5
Other diseases of digestive system	7	4
Acute nephritis and Bright's disease	40	36
Other dieases of kidneys	3	2
Diseases of prostate	4	2
Noncancerous tumors and other diseases female genital organs	8	4
Puerperal septicaemia		1
Other puerperal diseases	6	4
Gangrene		3
Malformations and injuries at birth	10	15
Premature birth	26	27
Congenital debility, atrophy, marasmus, etc.	22	23
Other causes peculiar to early infancy	7	1
Senility	14	23
Suicide	15	6
Acute poisonings, accidental, (except poisoning by food)	3	
Burns	4	4
Absorption of deleterious gases. Suffocation	8	17
Accidental drowning	5	1
Traumatism by firearms	4	3
Traumatism by fall	2	5
Traumatism by machines	1	1
R. R. accidents	12	9
Street car accidents	2	
Automobile accidents	3	4
Motorcycle accidents		1
Injuries by animals	1	
Traumatism by other crushing	4	1
Effects of heat	1	
Other external violence	3	1
Lightning	2	2
Fractures	1	
Homicide	4	4
Not specified or ill-defined	6	8
Stillbirths	49	34

DEATHS IN WATERLOO, IOWA, 1914 AND 1915.

(Exclusive of stillbirths.)

TABLE NO. 7—Continued

Cassification	1914	1915
Total for calendar year	337	338
Males	178	187
Females	159	151
White	330	332
Colored	7	6
Native	272	268
Foreign	61	64
Unknown	4	6
Single	116	113
Married	135	118
Widowed	81	94
Divorced	2	7
Unknown	3	6
Under 1 year	56	49
1 to 5 years	14	17
5 to 10 years	12	9
10 to 20 years	10	12
20 to 30 years	22	20
30 to 40 years	33	24
40 to 50 years	35	26
50 to 60 years	33	42
60 to 70 years	40	47
70 to 80 years	58	52
80 to 90 years	28	32
90 years and over	6	8
Typhoid fever	4	6
Measles	1	
Scarlet fever	3	3
Whooping cough	3	2
Diphtheria and croup	3	4
Influenza	1	3
Erysipelas	1	
Septicaemia	7	1
Tuberculosis of lungs	12	15
Other forms of tuberculosis	2	
Venereal diseases		1
Cancer and other malignant tumors	32	21
Rheumatism	2	
Diabetes	2	8
Exophthalmic goitre	2	1
Anaemia chlorosis	1	4
Other general diseases	2	3
Alcoholism	1	1
Simple meningitis	6	1
Cerebrospinal meningitis	1	1
Locomotor ataxia		1
Cerebral hemorrhage, apoplexy	32	29
Softening of the brain		1
Paralysis	5	7
General paralysis of insane	2	4
Other forms of mental alienation		1
Convulsions of infants	1	1
Other diseases of nervous system	1	2
Acute endocarditis	4	2

TABLE NO. 7—Continued

Cassification	1914	1915
Organic diseases of heart	24	37
Angina pectoris	4	1
Diseases of arteries, atheroma, aneurysm, etc.	7	5
Embolism and thrombosis	5	3
Hemorrhage; other diseases of circulatory system		1
Bronchitis	2	4
Bronchopneumonia	6	5
Pneumonia	28	23
Pulmonary congestion	1	
Asthma	2	
Other diseases of respiratory system	2	1
Ulcer of stomach		1
Other diseases of stomach	2	2
Diarrhoea and enteritis (under 2 years)	6	7
Diarrhoea and enteritis (2 years and more)	6	2
Appendicitis and typhlitis	4	7
Hernia and intestinal obstruction	6	4
Cirrhosis of liver	1	2
Gallstones		1
Other diseases of liver	2	
Peritonitis	4	2
Other diseases of digestive system	4	1
Acute nephritis and Bright's disease	20	26
Other diseases of kidneys		1
Diseases of the bladder		1
Diseases of prostate		1
Noncancerous tumors and other diseases female genital organs	2	2
Puerperal diseases (not including puerperal septicaemia)	3	1
Diseases of bones and organs of locomotion	2	
Malformations and injuries at birth	10	9
Premature birth	12	16
Congenital debility, atrophy, marasmus, etc.		5
Other causes peculiar to early infancy	2	
Senility	10	12
Suicide	5	4
Acute poisonings, accidental, (except poisoning by food)	2	1
Burns	2	3
Absorption of deleterious gases. Suffocation		1
Accidental drowning	3	1
Traumatism by firearms		1
Traumatism by fall	3	4
R. R. accidents	2	2
Automobile accidents	2	6
Motorcycle accidents	1	
Injuries by animals		1
Traumatism by other crushing	2	1
Excessive cold	1	
Other external violence	1	
Fractures	2	3
Homicide	1	1
Not specified or ill-defined	3	2
Deaths from all other causes		1
Stillbirths	15	28

SANITATION

Report of the Civil and Sanitary Engineer on Sanitary Surveys and Other Work for the Biennium.

LAFAYETTE HIGGINS,

Engineer Member of the Board.

Field Investigations—

Field trips and sanitary surveys relating to water supply, sewerage and sewage disposal, garbage disposal, and 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 treatment plants and garbage disposal.

(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.

The above classification of the work of the sanitary engineer represents the plan of work desired. Numerous inquiries bringing to the engineer duties not necessarily defined by statute required the services of the engineer, and so far as possible such duties have been performed. Prominent among such duties is the task of the supervision of installations for sewage disposal for consolidated schools, and other public schools situated in towns lacking sewer facilities. No appropriation has been granted for this work which is highly important from a public health standpoint. Approximately fifty such school buildings during the year ending June 30th, 1916, should have received the direct supervision of a sanitary engineer. This would have required the entire time of a competent engineer. Only a few of such public school buildings received the desired attention.

The inspection of public water supplies and sewage treatment plants which should be done each year would require the entire

time of two sanitary engineers. The engineer of the board has employed all available time in this work, but has accomplished only a small part of the needed inspection.

It is to be regretted that the engineer of the board has not been furnished with sufficient help to respond to the calls which have come to the State Board of Health.

FIELD TRIPS AND INVESTIGATIONS.

Places investigated, population and the purpose of the investigation.

Adel, 1,425. Sanitary survey and investigation of typhoid epidemic.

Afton, 1,007. Approval of new water supply.

Albia, 5,138. Inspection of sewage treatment plant and impounding reservoir.

Ankeny, 526. Sanitary survey.

Belle Plaine, 3,668. Investigation of sources of proposed new public water supply.

Bloomfield, 2,282. Consultation with city council relative to sewage treatment plants.

Burlington, 24,261. Investigation of public water supply.

Carroll, 4,031. Consultation with city engineer relative to reconstruction of sewage filter beds.

Cedar Rapids, 40,667. Investigation of complaint against starch works.

Clarinda, 4,478. Investigation of outbreak of typhoid fever at State Hospital.

Clinton, 26,091. Investigation of outbreak of typhoid fever.

Council Bluffs, 31,354. Sanitary survey and investigation of typhoid epidemic.

Cresco, 3,199. Investigation of public water supply.

Dyersville, 1,885. Consultation and advice relative to completion of sanitary sewer system and installation of sewage treatment plant.

Foster and New Foster, 379. Investigation of water supply.

Ft. Madison, 9,507. Consultation with city council relative to sanitary survey. Investigation of public water supply, and conference with city council and citizens relative to the installation of a new public water supply and additional sanitary sewers with sewage treatment plant. Consultation with engineer of Mississippi Power Company relative to sewage disposal of the State Penitentiary.

Garner, 1,226. Consultation with town council and conference with citizens relative to installation of sanitary sewer system and sewage treatment plant.

Grand Mound, 481. Investigation of public water supply and consultation with town council.

Kenwood Park, 559. Consultation with town council and engineer relative to the installation of sanitary sewer system with sewage treatment plant.

Keokuk, 15,239. Investigation of public water supply.

Knoxville, 3,541. Investigation and approval of source of new public water supply.

Lake View, 814. Consultation with town council and conference with citizens relative to installation of a sanitary sewer system with sewage treatment plant.

Lawler, 656. Consultation relative to disposal of creamery waste.

Lenox, 1,320. Consultation with town council relative to installation of sanitary sewer system and sewage treatment plant.

Mapleton, 1,200. Consultation with town council and conference with citizens relative to the installation of a sanitary sewer system and sewage treatment plant.

Mason City, 17,152. Consultation with city council and their consulting engineer relative to proposed sewage treatment plant.

Mt. Pleasant, 4,089. Survey for new sewage filters for State Hospital.

Mt. Vernon, 1,568. Consultation with city council and engineer relative to reconstruction and enlarging of sewage filter beds.

New Hampton, 2,664. Inspection of old sewage treatment plant and approval of location for new sewage treatment plant.

Oakdale, 400. Survey for sewage treatment plant for State Sanatorium and superintendence of construction of same.

Oelwein, 7,137. Inspection of sewage treatment plant.

Onawa, 2,210. Consultation with city council and conference with citizens relative to the installation of sanitary sewer system and sewage treatment plant, and the improvement of the public water supply.

Osceola, 2,714. Investigation of public water supply.

Ottumwa, 22,437. Inspection of public water supply and water purification plant.

Pisgah, 403. Consultation with directors of school district and architect relative to sewage treatment plant for consolidated school.

Peterson, 534. Consultation with town council relative to installation of sanitary sewer system and sewage treatment plant.

Rhodes (Edenville), 486. Investigation of location for deep well to furnish new public water supply.

Rockwell City, 1,864. Survey for location of sewage treatment plant for Industrial Reformatory for Females.

Rolfe, 1,115. Consultation with town council and health officer and conference with citizens relative to installation of a sewer system with sewage treatment plant.

Sigourney, 2,109. Investigation of public water supply.

Storm Lake, 3,158. Inspection of water filtration plant and conference with city council relative to reconstruction of the filter beds.

Strawberry Point, 1,158. Investigation of unsanitary conditions, and consultation with town council relative to installation of sanitary sewer system with sewage treatment plant.

Union, 600. Consultation with town council and conference with citizens relative to protection of the public water supply and the installation of sanitary sewer system with sewage treatment plant.

Washington, 4,544. Investigation of sewer system and conference with city council relative to installation of sewage treatment plants.

Wellman, 839. Consultation with town council and health officer relative to sewage disposal.

West Point, 564. Consultation with town council, and conference with citizens relative to installation of a public water supply system, and a sanitary sewer system with sewage treatment plant.

Woodward, 820. Survey for sanitary sewer system and sewage treatment plant for State Hospital and Colony for Epileptics.

Yale, 305. Inspection of new deep well for public water supply.

SANITARY SURVEYS.

SANITARY SURVEY OF NORA SPRINGS, JULY, 1914.

The sanitary survey of Nora Springs, a town of 1,148 population, followed complaints of long standing relative to the pollution of Shell Rock River by the discharge of untreated sewage, and was made in response to a petition signed by citizens of Nora Springs asking that the existing unsanitary conditions be investigated by the State Board of Health.

The sanitary engineer of the State Board of Health visited Nora Springs and in company with the members of the town council investigated the existing means of disposal of sewage and night soil and surface wastes. The situation had become more acute by reason of the fact that the town council had let contracts for fragmentary sewers to supply certain sections of the town with sewer facilities, thereby proposing to increase the amount of untreated sewage discharged into the Shell Rock River by the partial sewer systems installed.

At the meeting of the town council which the sanitary engineer attended, interested citizens discussed objections and made their complaints. As a result of this conference, the town council of Nora Springs agreed to employ a sanitary engineer to make the necessary surveys for the installation of a complete sanitary sewer system and sewage treatment plant.

On the request of the town council, the sanitary survey was completed, and included the examination of the water of all private wells used as a source of domestic water supply, and also included the investigation of private or residential sewage treatment plants.

The water of eighty-six private wells was examined. Of this number, eight were found to be good, sixteen were found to be suspicious, and sixty-two were found to be bad.

The public water supply of Nora Springs is furnished by a well 280 feet deep, located within the town limits. The analysis showed the city supply to be good.

The survey revealed the installation of forty-one cesspools and septic tanks used as private or residential sewage treatment plants. The pollution of some of the shallow wells was traced directly to the effluent from cesspools leaching through the soil to the water bearing strata in which the wells were situated. For the most part, however, the parties who have installed residential sewage treatment plants are making use of the city water supply.

The town council realized that the continuation of the practice of installing residential sewage treatment plants would be unsatisfactory, costly, and would more and more pollute the water supply of such shallow wells as would be maintained as a source of domestic water supply; and for the reasons stated the town council urged the installation of sanitary sewers.

The results of the analyses of the samples of water taken from private wells, establishing the unsatisfactory condition of such private water supply which results were embodied in the report made to the town council, made imperative the need for the installation of a complete sanitary sewer system with sewage treatment plant.

Following the report of the sanitary survey, municipal authorities of Nora Springs were directed to take the necessary steps looking toward the installation of a sanitary sewer system and sewage treatment plant in the near future.

It will be noted that the town council had agreed to proceed with the necessary surveys looking toward such installations, but it subsequently developed that there was sufficient opposition within the council to defeat the project, and at the date of this writing the necessary installations have not been made.

SANITARY SURVEY OF ANKENY, POLK COUNTY, JULY, 1914.

The town of Ankeny has a population of 500. At the time of the survey the town had neither public water supply nor sewer system, but six residential sewage treatment plants had been installed for the disposal of house sewage. The character of the soil is such that residential sewage treatment plants fail to operate successfully.

The sanitary engineer had investigated the conditions at Ankeny on three different dates, and at the time of each visit had met the citizens of Ankeny in a mass meeting.

At these meetings, the unsanitary conditions were reported and discussed and the need for a public water supply and a sanitary sewer system was impressed upon the people.

At the request of the citizens the water of all the shallow wells in use as a means of water supply was examined. One hundred and seven wells were examined. Of this number twenty-three are classed as good; fifty-six, as suspicious; and twenty-eight, as bad.

The town council of Ankeny was advised to take the necessary steps to install a satisfactory water supply, and a sanitary sewer system.

The advice given by the State Board of Health has been followed by the town council. A public water supply has been installed, and plans and specifications have been prepared for a sanitary sewer system which, according to present indications, will be installed during the year of 1917.

SANITARY SURVEY OF ELDON, WAPELLO COUNTY, JULY, 1913.

The sanitary survey of Eldon, a city of 3,020 population, was made in response to numerous complaints by residents of Eldon relative to the improper disposal of sewage, and in response to a petition from the city council.

The city of Eldon has several partial or fragmentary sewer systems. investigated the existing unsanitary conditions. It was also determined to test the water supply of private wells in use in the city.

The city of Eldon has several partial or fragmentary sewer systems, One of these systems empties directly into the Des Moines River; the others empty into a small creek or ravine running through the city. The nuisance reported was caused by the discharge of untreated sewage into the small creek running through the city. The survey made by the sanitary engineer revealed the necessity for a complete sanitary sewer system. The examination of the water of the wells revealed a state of serious pollution such as may be found in practically all of the Iowa cities and towns which have been in existence for thirty or fifty years or more. Eighteen private, or residential, sewage treatment plants were found in use. None of these private sewage treatment plants were provided with the necessary filtration, and the effluent from such sewage treatment plants contributed to the polution of the water of the wells. A considerable part of the population make use of the city water supply which is neither sufficient in quantity nor satisfactory in quality, but which is considered to be a safe supply. Samples from ninety-four wells and cisterns used as domestic water supply were examined. Of this number only three could be classed as good, nineteen were classed as suspicious, and the remaining seventy-two were found to be bad. The cisterns included in the above list were all found to be in bad condition, and in need of cleaning.

The city council was advised to take immediate steps to locate a new and satisfactory public water supply, and also to employ a sanitary engineer to make the necessary surveys to properly district the city and enable the council to take the necessary steps looking toward the early installation of a sanitary sewer system.

The city council expect in good faith to carry out the recommendations of the State Board of Health, but the majority of the residents of Eldon are opposed to making the necessary sanitary installations, and the recommendations have not been carried out at the time of the writing of this report

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SANITARY SURVEY OF SCANDIA AND ZOOK'S SPUR, DALLAS COUNTY, JULY, 1914.

The towns of Scandia and Zook's Spur constitute the mining camp of the Scandia Coal Company. There are fifty-eight company houses in Scandia, and fifty-four company houses in Zook's Spur, besides a few houses privately owned. The sanitary survey was made in response to a petition by the residents of Scandia, and included the investigation of Zook's Spur. In addition to the sanitary survey the investigation included the examination of the water of all the wells in use in Scandia (ten in number, and all of the wells in use in Zook's Spur, (fifteen in number).

In both of these towns the sanitary survey included an investigation of the condition of the streets, the premises, means of disposal of night soil, and the inspection of the houses occupied by the mining population.

The usual unsanitary conditions incident to mining camps prevailed. Rubbish and other surface wastes were much in evidence, and evidently no systematic provision had been made for their removal. The outside toilets were generally in bad condition, and were not constructed as sanitary privies. The analyses of the samples of water taken from the wells in Scandia showed one well to be satisfactory, three to be suspicious, and the remaining four to be badly contaminated. The analyses of the samples taken from the wells in Zook's Spur show that eight of the wells might be considered satisfactory, one of the wells suspicious, and the remaining six to be bad. The wells in Zook's Spur were in better condition than those in Scandia for the reason that the town of Zook's Spur at the time of the investigation had been in existence a few years only, while the town of Scandia had been in existence many years, thereby perpetuating conditions which more seriously polluted the wells.

The owners of the mining camp are endeavoring to supply the residents of Scandia with deep well water which is sanitary. They are also endeavoring to maintain good conditions in the camps, but have little co-operation from the residents of the camps. The report of the investigation set forth the necessary procedure for placing the camps in sanitary condition and properly protecting the water supply of the wells.

A complete report of the investigation was sent to the township trustees of Des Moines Township in which the mining camps are located with directions to carry out the instructions included in the report.

The township trustees have endeavored in good faith to carry out the instructions of the State Board of Health, but have met with partial success only.

This mining camp was included in the sanitary survey of Dallas County made by the United States Public Health Service during the summer of 1915, and the United States officials conducting the sanitary survey of Dallas County made use of the data obtained and the report made by the State Board of Health.

SANITARY SURVEY OF BEAR CREEK, WAPELLO COUNTY, JULY, 1914.

The sanitary survey of the mining town of Bear Creek was made in response to a petition by the residents of the town. The sanitary engineer visited the town of Bear Creek and investigated the condition complained of, and inspected the premises occupied by the mining population. The water supply of Bear Creek is furnished by the few shallow wells in the low land adjoining the creek, and by some deeper wells located in the hilly portion of the town. The wells in the hilly portion of the town were furnishing a scant supply. The wells in the lower or flat portions of the town were furnishing a sufficient supply at the time of the inspection, and the greater number of such wells were furnishing a water of fair degree of purity, although the well were not sufficienty protected against surface contamination.

There were about forty-two families in all in this mining camp representing over 200 population. This mining camp is one of the older mining camps, and the unsanitary condition of outside toilets was extreme. The toilets were themselves unsanitary, and the vaults of most of the toilets were in need of cleaning. Surface refuse which usually constitutes a serious menace in mining camps was present in some degree, but the conditions were not as deplorable as in the average mining camp. The township trustees of Center township in which Bear Creek is located were directed to visit the town of Bear Creek, inspect the same and require that all outside toilets or privies be placed in a sanitary condition.

This requirement necessitates rebuilding more than one-half of the outside toilets, and requires that all of the toilets be reconstructed as sanitary privies. The trustees were also directed to require that all the surface wells be cleaned and the walls of the same made water-tight for several feet below the surface of the ground with the walls carried above ground sufficiently that by grading the surface water will be turned away from the wells, and thereby prevent surface wash from entering the wells. The trustees were also directed to require additional wells to guard against the shortage of water during the dry season of the summer. Measures for disposing of refuse were also recommended, and the township trustees directed to carry out such recommendations.

SANITARY SURVEY OF FOSTER AND NEW FOSTER, MONROE COUNTY, JULY, 1914.

The sanitary survey of the mining camps of Foster and New Foster was made in response to a petition by the citizens of said camps. Foster is an incorporated town having a considerable population at one time, but at the present time has a population of only 129. The town of Foster has been largely abandoned, and the mining camp, New Foster, located several miles from Foster represents the present active mining camp of that particular coal district. The petition was occasioned by the scarcity of the water supply and its probable inadequacy for drouth periods. The investigation showed that the few wells remaining in the town of Foster and now depended upon for domestic water supply were not in satisfactory condition, such condition being caused partly by immediate surface pollution, and partly by ground seepage from outdoor closets.

The outdoor closets were found in the usual condition prevalent in mining camps. The sanitary survey revealed the necessity for a complete clean-up of the closet vaults and the reconstruction of the outdoor closets to meet the requirements for sanitary privies. The condition of the wells seemed to indicate that the company responsible for the camp should be required to construct additional sanitary wells to supply a safe water supply in sufficient quantity. Recommendations embodying the above requirements were transmitted to the township trustees of Monroe township for jurisdiction.

The town of New Foster is so situated that the shallow wells used as a source of water supply were easily contaminated by surface wastes, and by

seepage from outdoor closets. At the time of the survey there were 51 miners' houses in the camp, housing a population of approximately 250. The wells in use, eight in number, are shallow, and the majority of these were furnishing a scant supply. The analyses show all of the wells to be seriously polluted. The condition of the outdoor closets was unsatisfactory in all cases, and in some cases extreme neglect was apparent. In this camp surface refuse, garbage, etc., constitute a menace. Following the survey, the township trustees of Monroe township were advised to visit the camp, and require the proper collection and disposal of surface refuse, the cleaning and disinfection of privy vaults; and the proper equipment of existing wells to protect the same from surface pollution; and to require the construction of additional sanitary wells to give an adequate and safe water supply

SANITARY SURVEY OF SEYMOUR, AUGUST, 1914.

The sanitary survey of Seymour, a town of 2,146, was made in response to a petition filed with the State Board of Health by residents of Seymour.

The sanitary survey incuded the investigation of methods of disposal of night soil and surface refuse, and the field analysis of 113 surface wells used as a domestic water supply.

Sixteen of the surface wells were found to be good, twenty-five were found to be suspicious, and seventy-one were found to be bad.

The public water supply of Seymour is impounded, and the water is not used for drinking purposes, and is but slightly used for cooking.

No regular sanitary sewer system has been installed. There are three fragmentary sewers opening into an open sewer ditch within the corporate limits of the town.

The conditions are such as to invite epidemics. The town has long been in need of an adequate public water supply suitable for domestic purposes, and for many years has been in need of a better means of sewage disposal.

No steps have been taken by the town authorities to provide the necessary sanitary installations, and the attitude of the authorities up to the time of the sanitary survey has been that they will not take the necessary steps to make adequate sanitary installations until they are forced to do so.

At the time of the writing of this biennial report, it is understood that the municipal authorities are considering the installaton of a sanitary sewer system.

SANITARY SURVEY OF MECHANICSVILLE, AUGUST, 1914.

The sanitary survey of Mechancsville, a town of 816 population, was made in a petition filed with the State Board of Health by residents of Mechanicsville.

Mechanicsville has a public water supply taken from the city well which is an eight inch bored well about three hundred feet deep. The town has

no sanitary sewer system, and has been depending upon residential sewage treatment plants and cess pools for the disposal of domestic sewage.

The sanitary survey included the usual investigation of disposed of night-soil and surface wastes, the investigation of residential sewage treatment plants, and the field analyses of twenty-six surface wells and the city well.

Of the twenty-six surface wells in use, six were found to be good, six were found to be suspicious, and fourteen were found to be bad. The number of shallow wells in use is not large, indicating that the city water is quite generally used.

The survey revealed the presence of eighty cesspools or private disposal plants. The majority of the cesspools apparently have no direct outlet, the overflow from such cesspools being allowed to seep away into adjajcent soil. Apparently fifty-five of the cesspools had no direct drainage outlet. Two of the cesspools drain directly to ponds; two, into tile; fifteen, into ditches or upon open ground. Six abandoned wells are used as cesspools.

Evidently the residents of Mechanicsville have attempted to solve the question of sewage disposal by means of cesspools, there being probably more cesspools in proportion to the population than in any other town in Iowa. This town also illustrates the fact that such a plan is unsatisfactory as a substitute for a sanitary sewer system.

No definite steps have been taken looking toward the installation of a sewer system, although the State Board of Health has recommended the installation of a sanitary sewer system in answer to complaints which have been filed.

SANITARY SURVEY OF FT. MADISON, AUGUST, 1914.

The city of Ft. Madison containing 9,796 population including the inmates of the State Penitentiary is situated on the Mississippi river in Lee County.

The configuration of the location is such that the city is built along the bank of the river in by far its greatest dimension, and only a small portion of the city is built upon the high hill side.

The city has a very poor public water supply, the intake for the water being situated in the Mississippi River quite near the Iowa shore. The bad condition of the water was greatly increased when the Keokuk dam was placed in commission, thereby raising the water above the normal water level about seventeen feet. The water taken from the Mississippi River is exceedingly turbid at all periods of the year, contains a large amount of marsh ooze, and a considerable sewage content. A sample of this water taken from the tap at the hotel was heavily turbid, of a chocolate color, and when held at room temperature, about seventy degrees Fahr., passed through various cycles of decomposition and purification. A definite sewage content was indicated by the behavior of the sample showing black discoloration with hydrogen sulphide gas present in quantity. It required about two weeks at room temperature for the clarification and sedimentation of the sample. This condition of the city water

made it necessary for the State Board of Health to condemn its use for drinking and culinary purposes.

The chemist of the State Board of Health visited Ft. Madison and spent in all about two weeks' time investigating the public water supply, and the condition of the water furnished by shallow wells.

The sanitary engineer of the board visited Ft. Madison and investigated the condition of the public water supply, and the provisions for the disposal of sewage and surface wastes.

It was determined to examine the domestic water supply of the city which consisted mainly of water taken from shallow wells and cisterns. A small part of the population made use of the water from four or five deep wells located within the town. The deep well water was found to be so heavily mineral that it is unsatisfactory for general use.

The survey of the domestic water supply revealed the use of eighty-six cisterns supplied by roof water. Of this number, one cistern was found to be so highly contaminated as to suggest leakage contamination from ground water entering through leaky walls. Seventy of these cisterns were in bad condition, if not dangerous, through failure to clean them when necessary. Fifteen of the cisterns were found to be in good condition. The survey also revealed the use of three hundred and twenty-one shallow wells, of which thirty-six might be counted good, fifty-six considered suspicious, and two hundred and twenty-nine were found to be bad, the most of these being seriously contaminated.

A study of the underlying strata indicated that it would be impossible to make use of any type of shallow well for any considerable period of years without such well becoming seriously contaminated.

The sanitary survey was made partly in response to the request of the city officials, and partly in compliance with a petition filed with the State Board of Health.

The results and findings of the sanitary survey were such that the city officials determined to take immediate steps looking toward the installation of a safe and sanitary public water supply. Plans and specifications for a new public water supply system, including a modern water purification plant have been prepared and approved, and contracts have been let for the construction of the same.

The city has also undertaken to complete and correct the present sewer system, intercepting all of the present outlet sewers, and carry the sewage to one common pumping plant where the sewage will be lifted and discharged into the Mississippi River. The present sewer plans include the sewering of portions of the city not yet supplied with sanitary sewers.

The dangerous, unsanitary conditions existing are fully understood by the city officials who, as rapidly as possible are taking the necessary steps to correct the same.

SANITARY SURVEY OF LORIMOR, AUGUST, 1914.

The town of Lorimor is a town of about 700 population, without a public water supply or sanitary sewer system. It is situated in a locality where shallow wells become easily contaminated and liable to infection

at any time. For several years past a few cases of typhoid fever have occurred at Lorimor, and in the country adjacent. During the year 1914, typhoid fever became epidemic in Lorimor.

In response to a petition filed with the State Board of Health, a sanitary survey of Lorimor was made during August, 1914.

The sanitary engineer visited Lorimor, and investigated the unsanitary conditions existing, the condition of shallow wells, and the means of disposal of refuse and night-soil.

It was determined to examine the water of all the wells used in furnishing the domestic water supply. Out of one hundred and seventy-two wells examined, only five could be considered good. Fifty-seven of the wells would be rated as suspicious, and one hundred and ten would be considered bad. Many of the wells were seriously contaminated. The examination of the character of the ground, and the methods of well construction revealed definite reasons for the excessive contamination of the wells. The greater portion of the town, while located in a tolerably well elevated region, is decidedly flat, and the drainage poor. Where the shallow wells are dug wells, the walls were not laid in mortar, and the coverings or platforms of the wells were so poorly made as to afford little protection against surface seepage. A large proportion of the wells are tile wells, or bored wells. The construction of these wells is such as to promote the pollution or contamination of the water of the wells from surface seepage. In practically all cases, these wells were constructed by first boring the well, and then dropping down into the well the sewer tile without cementing the joints of the tile and without grouting the gap outside of the tile, between the tile and the earth. The majority of these tile wells were not properly protected with suitable platforms so that seepage could not only enter the well by flowing down immediately outside of the tile, but by obtaining access through the poorly equipped platforms.

Investigation of typhoid cases occurring in Lorimor at different times located the immediate cause of the typhoid in the infected water of the shallow wells. The installation of a number of private sewage treatment plants added to the infection of the wells. The spread of the typhoid was largely due to flies, the unsanitary condition of the outside toilets being such as to afford full opportunity for the distribution of the typhoid germs.

Following the sanitary survey the State Board of Health recommended to the town council of Lorimor that immediate steps be taken to obtain a safe and sanitary public water supply, so that the use of the shallow wells might be abandoned. It was also recommended that steps be taken to install a sanitary sewer system with sewage treatment plant. It was further recommended that pending the installation of a public water supply system and sanitary sewer system, the outside toilets or privies should be cleaned and sterilized, and made sanitary and fly-proof; and that the necessary care be given to the toilet vaults, the same to be cleaned and disinfected at least twice each year. It was also recommended that a system for the collection and disposal of garbage should be established.

The town council has taken steps looking toward the installation of a public water supply.

SANITARY SURVEY OF WINFIELD, SEPTEMBER, 1914.

Winfield is a town of approximately 1,000 population. Just prior to the making of the sanitary survey, the officials of Winfield had taken steps to install an adequate public water supply. For several years previous, a meagre water supply was found sufficient to accommodate the residents, who desired to make modern installations in their homes. At the time of the survey, eighteen private or residential sewage treatment plants had been installed. In some instances the effluent from such disposal plants was allowed to discharge openly into street gutters or directly upon open ground. From the business section of the city certain fragmentary sewers carried the effluent from the private disposal plants, discharging the same into open fields.

The rapid increase in the demand for public water supply led to the installation of the new public water supply, and also necessitated some action on the part of the town council relative to sewage disposal.

The sanitary engineer of the Iowa State Board of Health visited Winfield, investigated and approved the source of the public water supply, and also made a brief sanitary survey of the town. It was then decided that it would be best to investigate the condition of the shallow wells in use, and upon petition of the town council, the sanitary survey was extended to include the examination of all sources of domestic water supply.

The survey revealed two hundred and sixty-three wells in use of which eighty were found to be good, twenty-five were found to be suspicious, and one hundred and fifty-eight were found to be bad. The conditions found in many of the wells classed as bad were extreme, and it would appear to be a matter of good luck only that the town of Winfield had so long escaped disastrous epidemics.

The surveys made by the Civil and Sanitary Engineer and the Assistant Chemist of the Iowa State Board of Health warrant the following recommendations:

First. That the public water supply of the town of Winfield should be extended to reach all parts of the town as soon as the proposition can be fully financed, it being understood that the present water system is intended to be so extended.

Second. That the Town Council forbid by resolution, or ordinance if necessary, the further installation of residential sewage treatment plants.

Third. That all outside toilets shall be made sanitary and fly-proof, and maintained in a sanitary condition by the proper disposal of the contents of the vaults of such toilets, and by the proper disinfection of the vaults.

Fourth. That the Town Council of Winfield take the necessary steps to obtain a complete survey of the town of Winfield, establishing the necessary sewer districts, and shall proceed without unnecessary delay to take the necessary legal steps looking toward the installation of a sanitary sewer system, to be equipped with a properly designed, properly constructed and properly operated sewage treatment plant, or plants.

Fifth. That a more complete system of garbage disposal shall be determined upon so that the disposal of garbage may be more effectively accomplished.

It is the understanding of the State Board of Health that the recommendations have been followed out, except that the sewer system has not been installed, although steps have been taken looking toward securing the necessary surveys for such installations.

SANITARY SURVEY OF YODER, OCTOBER, 1914.

Yoder is a mining camp containing twenty-nine houses, and having a population of eighty-six at the time the sanitary survey was made. It is located in Delaware Township, Polk County, Iowa.

The sanitary survey was made in response to a petition filed with the State Board of Health by residents of Yoder.

The complaint in the petition related to the water supply of the town which is furnished by shallow wells of the type known as tile wells or bored wells.

The sanitary survey included the examination of the water of all the wells, and the investigation of the condition of outdoor closets, and the condition of the homes and premises.

All of the wells showed heavy and serious contamination from seepage from closet vaults and surface waste.

The township trustees of Delaware Township were instructed to take the necessary steps to require the company responsible for the town to place all toilet vaults in a sanitary condition, removing and safely disposing of the contents of vaults, and disinfecting the vaults; to require the outside toilets, or privies, to be constructed as sanitary privies; to require that the existing wells be closed, and new wells sunk in safe locations. It was recommended that the wells be dug wells with the walls of the same cemented to such depth as may be found necessary to exclude surface seepage; that the walls of the wells be continued above ground a sufficient height so that by proper filling in of earth, surface drainage would be turned away from the wells, and the wells to be equipped with cement or water-tight platforms to exclude surface pollution.

The township trustees undertook in good faith to carry out the recommendations made, and with some degree of success.

SANITARY SURVEY OF ANDERSONVILLE, MARION COUNTY, NOVEMBER, 1914.

Andersonville is a mining town, owned and operated by the Anderson Coal Company, and is located in Knoxville Township, Marion County, Iowa. The sanitary survey was made in response to a petition made by the miners asking for an adequate water supply. At the time of the sanitary survey, the unsanitary conditions were not extreme, because the mining camp had been but recently established. The town is well situated on a high hill where the surface drainage is good. The water supply was taken from two drilled wells. The water furnished by these wells is heavily mineral, and is not well suited to domestic use. The wells were

equipped with hand force pumps difficult to operate. The supply furnished by the wells was barely adequate for the population living in the town at the time. At the time of the survey, the company had drilled a third well which was abandoned, and were attempting to lay their new wells in satisfactory locations.

The complaint stated in the petition was well founded as to the amount of water supplied and the mineral character, but was not found to be unsanitary.

The township trustees of Knoxville Township were directed to follow up the matter and require an adequate water supply, and also to require that all of the privies be constructed as sanitary privies, and maintained in a sanitary condition, and were also instructed to require a satisfactory method of collection and disposal of surface refuse.

SANITARY SURVEY OF LAWLER, CHICKASAW COUNTY, NOVEMBER, 1914.

The sanitary survey of Lawler, a town of about 7,000 population, was made in response to a petition filed with the State Board of Health by citizens of Lawler, following an epidemic.

The history of the epidemic cases did not indicate a typhoid fever epidemic, although the epidemic caused considerable alarm, and may have been paratyphoid. It was apparently a water-borne epidemic, as the examination of the wells indicated.

At the time of the survey, Lawler had a public water supply, but no sanitary sewer system. As is usual in such cases, many of the residents of the town had installed modern sanitary conveniences in their homes, and had made use of residential sewage treatment plants for the disposal of the residential sewage. Fifteen of these sewage treatment plants are cesspools, and seven are septic tanks. In a few cases, the cesspools are barrels sunk in the bottom of the cellars of the houses. In a few cases these residential sewage treatment plants discharge their effluents into street gutters or open ditches, and in other cases the effluent seeps away into the soil finally reaching the water-bearing strata in which shallow wells are located.

The outside toilets still in use were of the ordinary type, not sanitary and with leaching vaults.

At the time of the survey, it was decided to field test the water of all wells used as a source of domestic water supply. There were one hundred and twenty-one wells so used, ninety-five of which are driven wells, twenty-five are drilled wells, and one is a dug well. The driven wells are all quite shallow, running in depth from twelve feet to thirty feet. The drilled wells run in depth from twenty-five feet to one hundred and thirty feet. The dug well is a shallow well three feet in diameter, and fifteen feet deep. Analyses show forty-nine of the wells to be good, thirty-five to be suspicious, and thirty-seven to be bad. This showing is better than is usually found in towns of like age and size, and is due to the large number of driven wells and drilled wells, and to the absence of tile wells and the scarcity of shallow, dug wells. The number of bad and suspicious wells, a total of seventy-two, indicated the necessity of abandoning shallow wells as a source of domestic water supply.

The finding of the sanitary survey warranted the following conclusions and recommendations:

1st. That the water supply of individual wells is being slowly contaminated with the result that many of the wells contain deleterious contents to a sufficient extent to place such wells under suspicion, while a goodly proportion of the wells show a pollution contained sufficiently great to classify such wells as *bad*. A considerable proportion of the wells may be classified as *good*.

2d. That the water of many of these wells is liable to infection at any time and therefore liable to disseminate the germs of typhoid fever and other common intestinal diseases.

3d. That the installation of residential sewage treatment plants is a menace to the water supply of individual wells and therefore a menace to the health of the people.

4th. That in some degree the outside toilets of the town may be responsible for the existence and perpetuation of communicable diseases by reason of the unsanitary condition of such toilets, allowing flies to become carriers of the germs of such diseases.

The recommendations are:

1st. That the use of the public water supply should be promoted as rapidly as possible in the immediate future, or as rapidly as the project can be legally financed.

2d. That immediate steps be taken looking toward the installation of a sanitary sewer system in the near future. It is understood that the immediate steps necessary are the survey of the town, upon which to base a resolution of necessity, and the passing and publication of the necessary resolution of necessity.

3d. That the Town Council forbid the further installation of residential sewage treatment plants as a means of sewage disposal.

4th. That regulations be made, if not already existing, requiring that outside toilets be made sanitary and fly-proof. That the vaults of such toilets be emptied and cleaned twice a year, in the Spring and Fall, and at such other times as may be found necessary, and that the vaults when cleaned shall be properly and thoroughly disinfected, and that disinfection be required at any time when determined by the Health Officer to be advisable or necessary.

That the contents of the vaults be removed to some remote, safe and satisfactory location, where said contents may be disposed of in accordance with the statutes governing the depositing of night soil, and that such contents shall be disposed of by burial or chemical treatment, or both.

5th. That a better system of the collection and disposal of garbage, offal from barns, and surface refuse of all kinds, shall be determined upon and carried out.

The recommendations made by the State Board of Health have been partly carried out, and surveys have been made looking toward the installation of a sanitary sewer system with sewage treatment plant.

SANITARY SURVEY OF COUNCIL BLUFFS, NOVEMBER AND DECEMBER, 1914, AUGUST, 1915.

Council Bluffs has a population of about 31,000. The sanitary survey was begun in response to a petition filed with the State Board of Health by Council Bluffs citizens, which petition was occasioned by the continued occurrence of typhoid fever which for several years had become epidemic during the summer and fall of each year.

In response to the petition before mentioned, on November 12, 1914, the sanitary engineer of the State Board of Health went to Council Bluffs and met the Mayor, Dr. M. B. Snyder, and the Health Officer, Dr. C. H. Bower, and held a consultation with them relative to the then existing typhoid epidemic in Council Bluffs.

The history of the tyhpoid cases was obtained almost wholly through the efforts of Dr. Bower, who obtained the epidemiological data of the cases from the attending physicians. It was not possible to obtain complete data for the complete record, but the inquiries were sufficiently answered to enable us to chart the cases, and later to enable Dr. Grover to draw the conclusions which are given in his report. A summary of the cases showing the sex, age, occupation, date of onset, date of recovery or date of death, and data relating to the use of water, taken from these reports, is herein given. Since this investigation was made during the continuance of many of the cases, it was not possible to give the date of recovery of such cases, however, the list of deaths is believed to be complete, the same having been verified by the reports on file in the office of the Iowa State Board of Health.

It will be noted in this report that several of the patients are reported as using city water only, where in all probability a number of such patients did use well water at times. For instance, it is altogether likely that any school boy, and probably almost any school girl, attacked by the fever, occasionally drank well water, even though the city water was used at the school and at the home. It is also likely true that almost any laborer occasionally used well water, although at the place of his employment city water was used.

The reports are not complete, and on the whole the deductions as to the use of water do not give full credit in the use of well water. The chart shows that a number of people who use city water also use water from a public street well located at the intersection of Frank street and Broadway. There were two such wells, one located on the north side of Frank street, and the other on the south side. These wells were considered spring water outcropping at that locality at one time. The water from these wells was clear, cold and palatable, and very many people drank from these wells. A visit to this locality indicates that it would be impossible to obtain shallow well water, or spring water, uncontaminated.

There seemed to be such relation existing between the location of typhoid patients and the use of the water of these wells that the Health Officer placed these wells under suspicion, and analysis of the water of these wells were made at his request by Joseph B. Thornell, City Chemist of Council Bluffs, under date of August 31, 1914. The analyses of these wells are here appended.

Abbreviations:—
af=animal forms, a=algae, c=colorless, b=brown, g=green, Fe=iron, sm=small cons=considerable, sl=slightly.

Determinations	Well at Broadway and Frank St. North Side	Well at Broadway and Frank St. South Side	State Standards for Shallow Wells Parts per Million
	None	None	
Turbidity			
Sediment			
Nitrogen as free ammonia	.020	.050	.0250
Nitrogen as nitrites	.001	.002	.00010
Nitrogen as alb. ammonia	.050	.150	.1750
Nitrogen as nitrates	8.00	20.00	.7500
Chlorides	4.6	7.9	3.50
Phosphates			1.75
Residue on evaporation			350.00
Volatile solids			
Fixed solids			
Color and odor on ignition	0.5	1.5	
Microscopical			
Bacteriological			
	(North side well.)	(South Side Well.)	
1. Coli test (Dextrose Broth). 37°C			
After 24 hours		After 24 hours	
5 cc water 50% gas.		5 cc water 50% gas.	
1 cc water 60% gas.		1 cc water 70% gas.	
After 48 hours.		After 48 hours.	
5 cc water 40% gas.		5 cc water 40% gas.	
1 cc water 70% gas.		1 cc water 30 % gas.	
2. Total Bacterial Count.			
(Nutrient Agar) 48 hrs. room temperature.		(Nutrient Agar) 48 hrs. room temperature.	
1 cc 600.		1 cc 900.	

(Signed) JOSEPH B. THORNELL, Chemist.

These wells were later condemned and permanently closed. Reference to these wells is made in the report of Dr. Grover. Later mention will be made of the analyses of other wells of the city, which were made by Mr. Jordan.

The investigation did not reveal any connection between food and milk supply, and the outbreak of typhoid fever cases. As later stated in this report the city water is not chargeable as being connected with the cause or transmission of the typhoid fever of this outbreak, although the facts shown upon the chart might cause the city water to be placed under suspicion. The reasons for eliminating the city water are given in Dr. Grover's report, and also in the report of the sanitary survey. The tentative conclusion reached early in the investigation was that the use of shallow well water was principally responsible for the transmission of the typhoid fever.

There is now appended a chart of the typhoid cases made up from the report obtained. The case numbers shown upon the chart refer to the date of onset, or the date when the patient took to bed. These case numbers are also placed upon the accompanying map of Council Bluffs, found later in this report. The locations there given are closely approximate, the map being of too small a scale to permit of exact locations. The report of Dr. Grover follows:

REPORT OF DR. GROVER.

August 23, 1915.

Mr. Lafayette Higgins, Sanitary Engineer,

State Board of Health, Des Moines, Iowa.

At your request, I went to Council Bluffs on August 12th to make an epidemiological investigation of an epidemic of typhoid fever and to hold a conference with you relative to certain recommendations to be made to the city of Council Bluffs as a result of this investigation and of a sanitary survey that has been made. I find that for years, Council Bluffs has had endemic typhoid fever which has become more or less epidemic each spring and fall. The following table shows the number of cases (C) and deaths (D) from this disease in so far as records are at hand:

Year	1905		1906		1907		1908		1909		1910		1911		1912		1913		1914		1915	
Months	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D
Jan.			0	0	1	0	0	0	0	0	*	3	4	1	4	0	3	1	0	0	1	0
Feb.			0	0	2	0	0	0	0	0	72	3	4	0	1	1	1	1	0	0	0	0
Mar.			0	0	1	0	0	0	0	0	21	2	0	0	1	0	2	0	0	0	3	1
April			1	0	0	0	0	0	1	0	10	1	0	0	0	0	1	0	1	0	0	0
May			0	0	0	0	0	0	0	0	0	0	0	0	6	0	5	1	4	0	0	0
June			0	0	0	0	0	0	0	0	0	0	0	0	9	0	5	1	3	0	5	0
July	*	0	*	0	*	0	*	0	*	1	0	0	0	0	5	0	1	0	3	0	--	--
Aug.	*	0	*	0	*	0	*	0	*	1	0	0	1	1	13	2	1	0	0	10	--	--
Sept.	*	2	*	1	*	0	*	2	*	0	0	0	4	0	7	0	6	2	24	3	--	--
Oct.		0		0		0		0		0	14	0	6	0	5	0	3	1	30	3	--	--
Nov.		2		0		0		1		1	5	0	1	0	4	0	2	0	3	2	--	--
Dec.		0		0		2		1		2	14	0	6	2	5	1	0	0	0	2	--	--
Totals.		5		1		6		4		7	116	9	36	4	60	4	30	7	78	10	9	1

*No record.

CHART OF TYPHOID CASES, 1914 EPIDEMIC, COUNCIL BLUFFS, IOWA.

Case No.	Sex	Age	Occupation	Date of Onset	Date of Recovery	Date of Death	Remarks
1	Female	10	Schoolgirl	July 27	Oct. 3		Used city water and well water.
2	Female	8	Schoolgirl	July 29	Oct. 3		Used city water and well water.
3	Female	32	Housewife	Aug. 5	Not given		Used well water. Husband had typhoid fever 8 years previously.
4	*Male	10	Schoolboy	Aug. 5	Not given		Used well water.
5	Male	26	Car repairer	Aug. 18	Sept. 30		Used well water.
6	Female	11	Schoolgirl	Aug. 21	Sept. 27		Used city water and well water.
7	Female	76	Domestic	Aug. 23		Sept. 16	Used well water.
8	Female	23	Nurse	Aug. 29	Oct. 10		At Emerson, Iowa, 3 weeks prior to sickness.
9	Male	8	Schoolboy	Sept. 5	Sept. 25		Used city water.
10	Female	15	Schoolgirl	Sept. 7		Sept. 23	Used city water and well water.
11	Male	30	Machinist	Sept. 10	Not given		Used city water and well water.
12	Male	35	Butcher	Sept. 13	Nov. 3		Used city water.
13	Male	60	Retired	Sept. 13	Oct. 9		Used city water and water from the Frank Street well (Broadway).
14	Female	Adult.	Car cleaner	Sept. 13	Nov. 1		Used city water principally.
15	Female	19	Nurse	Sept. 18		Oct. 23	Used city water.
16	Male	34	Switchman	Sept. 19	Nov. 15		Used city water and the water from Frank Street well (Broadway).
17	Male	10	Schoolboy	Sept. 20	Nov. 15		Used well water at home.
18	Male	28	Salesman	Sept. 20	Oct. 10		Used city water and water from well at Frank Street and Broadway.
19	Male	35	St. R. R. conductor	Sept. 21	Not given		Used city water principally.
20	Male	14	Schoolboy	Sept. 21		Oct. 3	Used well water, public street well.
21	Male	48	Grocery clerk	Sept. 27	Oct. 5		Used city water and water from well at Frank Street and Broadway.
22	Female	56(?)	Housewife	Sept. 28	Oct. 26		Used well water.
23	Male	20	Farmer	Oct. 1		Oct. 19	Used well water. Patient came from Honey Creek.
24	Male	38	R. R. employe	Oct. 1	Oct. 28		Used well water principally, water from Frank Street and Broadway.
25	Female	18	Schoolgirl	Oct. 3	Nov. 5		Used city water.
26	Female	11	Schoolgirl	Oct. 5	Nov. 15		Used city water.
27	Male	35	Laborer	Oct. 5	Not given		Used city water.
28	Female	4	Child	Oct. 6	Not given		Used well water.
29	Male	12	Schoolboy	Oct. 6	Not given		Used well water.
30	Female	5	Child	Oct. 7	Nov. 10		Used city water principally.
31	Male	11	Schoolboy	Oct. 8	Oct. 29		Used city water.
32	Male	47	R. R. Laborer	Oct. 10	Nov. 20		Used city water.

CHART OF TYPHOID CASES, 1914 EPIDEMIC—Continued.

Case No.	Sex	Age	Occupation	Date of Onset	Date of Recovery	Date of Death	Remarks
33	Male	42	Farmer	Oct. 10	Nov. 3		Used well water. Lived in Council Bluffs about four days each week.
34	Female	26	Housewife	Oct. 10	Nov. 15		Used well water.
35	Female	10	Schoolgirl	Oct. 14	Nov. 28		Used city water.
36	Female	31	Housewife	Oct. 17	Nov. 15		Used city water.
37	Male	34	R. R. clerk	Oct. 17	Nov. 9		Used city water.
38	Female	40	Housewife	Oct. 19	Nov. 9		Used city water principally.
39	Female	18	Housewife	Oct. 19	Recovering		Used well water.
40	Male	6	Schoolboy	Oct. 20	Not given		Used well water.
41	Male	30	Carpenter	Oct. 20		Nov. 2	Used city water principally.
42	Female	Adult	Laundry worker	Oct. 20	Recovering		Used city water part of time.
43	Female	22	Clerk	Oct. 20	Recovering		Used city water principally.
44	Female	26	Nurse	Oct. 29	Nov. 13		At Tabor month previous to illness. Used well water.
45	Male	21	Medical student	Oct. 22	Not given		Used city water principally.
46	Female	30	Housewife	Oct. 22	Recovering		Returned from Colorado Oct. 15; used well water.
47	Female	10	Schoolgirl	Oct. 23	Not given		Used city water principally.
48	Male	37	Plasterer	Oct. 23		Oct. 30	Used well water principally. Also city water and Frank Street and Broadway well.
49	Male	19	R. R. mech. helper	Oct. 24	Not given		Used city water.
50	Male	30	Laborer	Oct. 25	Rec'g slowly		Used well water.
51	Female	45	Housewife	Oct. 25	Not given		Used city water principally.
52	Male	28	R. R. employe	Oct. 25	Not given		Used city water principally.
53	Female	14	Schoolgirl	Oct. 29		Nov. 20	Used city water principally.
54	Male	10	Schoolboy	Oct. 29	Nov. 15		Used well water principally.
55	Male	15	Schoolboy	Oct. 30	Not given		Used city water principally.
56	Female	8	Schoolgirl	Oct. 30	Not given		Used city water.
57	Male	45	Baggageman, U. P.	Oct. 30	Not given		Used city water.
58	Male	40	Photographer	Oct. 30	Not given		Used city water.
59	Female	Adult	Housewife	Nov. 1	Recovering		Used well water.
60	Female	13	Schoolgirl	Nov. 8	Not given		Used city water occasionally, cistern water mainly (boiled).
61	Female	50	Cook in restaurant	Nov. 8	Recovering		Used city water principally.
62	Male	17	Schoolboy	Nov. 15	Dec. 2		Used city water principally.
63	Male	21	R. R. laborer	Dec. 1	Not given		Used city water principally.
64	Female	34	Housewife	Dec. 7	Not given		Used city water.

*Son No. 3.
Also ten doubtful cases at Orphan's Home, beginning Oct. 9, diagnosed by attending physician as "Intestinal Troubles."

The reports of deaths issued by the State Board of Health differ somewhat from the above and are as follows by years:

1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
8	2	9	7	9	13	4	4	8	9

This difference, I presume, is made up of those deaths in other towns that are credited to Council Bluffs.

The epidemic of 1914 is the one at present under investigation. This started in April and reached its length in October, after which time it rapidly died out. In the investigation which was carried out in November, sixty-four cases were looked up. Of these twenty-four gave positive Widal tests, five gave negative and the rest evidently were not tried. The percentage of positive tests, however, is high enough to show that the diagnosis of typhoid fever was correct.

This previous epidemiological work was carried out by you, and I understand that in your report you will tabulate the cases by ages, occupations, etc. In general the cases were nearly all located in the flat portion of the city and along both sides of Indian Creek, which runs down from the bluffs east of the city and divides the town in halves.

This epidemic was so slow in onset, with rather long prodromes, that one would hardly expect milk or other food supply to be the causative factor. There could be found no relation whatever to the milk supply. This was gone into thoroughly at the time by Dr. C. H. Bower, the local Health Officer. I personally looked up some of the earlier cases and found that these raised their own milk and did not sell to others. There was no common source of food supply.

The water supply of those infected was as follows:

26.9% used city water solely.
7.8% used city water principally.
1.5% used city water together with Omaha city water.
33.3% used city water and well water.
14.1% used well water only.
7.1% used river water.
1.5% used spring water only.
7.8 appeared to be doubtful.

From this we see that 78.5% used city water wholly or in part and that 47.4% used well water, with 15.6% that may have done so. The city water is carefully treated and bacteriological examinations are made at least daily but generally more often. Chemical analysis are made very frequently. I have at hand a copy of the report of the Board of Waterworks Trustees which gives all of this in detail. From a careful examination of the bacteriological and chemical reports for several years, it seems perfectly safe in ruling out the city water as the cause of typhoid fever in Council Bluffs.

There are about eight hundred wells in the city, most of which are shallow ones poorly constructed and situated for the most part in unhygienic situations. One hundred and nine of these have been examined by Mr. Jordan and a very great proportion were found unsafe for drinking purposes.

A large number of cases of typhoid fever were traced directly to three or four public wells. These have been closed and typhoid fever immediately ceased in the neighborhood.

From a careful examination of all data at hand, I feel obliged to agree with you that the great factor in causing typhoid fever in Council Bluffs has been the use of contaminated water from shallow wells. The source of infection of the wells is probably from carriers through open privies, situated in many cases very near the wells. Flies are probably another factor in the spread of the disease, in some cases from open privies to food supply of adjacent houses. It has been noted that the disease followed the course of Indian Creek. This creek is somewhat of an open sewer and there can be no doubt but that flies and possibly rats are a factor in carrying filth and infection from this creek to neighboring houses. One reason for considering flies to be a considerable factor here is due to the large numbers of them seen all about town, especially at this time when flies are comparatively scarce in most communities. In walking about the streets, one is immediately struck with the great swarms of them about the sidewalks and stores. Also in the poorer districts of the city where typhoid fever was most prevalent, the houses are not well screened. At times Indian Creek overflows the flat portion of the city. At such times wells certainly become contaminated. From the examination of the wells already mentioned, one would believe that the ground water throughout this district is contaminated as some of the wells that were not over a year old were as badly contaminated as the older ones.

In looking over the rainfall reports from the Omaha station one sees that in almost every instance a heavy rain following a long rainless period was soon followed by an outbreak of typhoid fever in this district. This goes to show that contamination of these wells also takes place by surface washings probably from nearby open privies.

The sanitary survey carried on by you shows the general sanitary conditions of the city to be pretty poor. However, the most noticeable things are the wells, privies, and creek already mentioned.

A large proportion of the area involved has already had water and sewers installed but the adjacent property has not been compelled to use the same. The Health Officer states that 50% of the people in this district move every year, which is another factor in the spread of typhoid fever, as many of the people are undoubtedly carriers and hence, as they move about, other wells become infected. Your report will show by maps the location of all cases of typhoid fever, the water mains and sewers and will also indicate locations of wells examined.

As a result of the conference between us, it seems as if certain recommendations should be made to the city of Council Bluffs, viz:

1. More rapid extension of sewers and water mains.
2. Compelling the adjacent property owners to connect with sewer and install city water supply. Meanwhile as a temporary condition to maintain a more rigid sanitary inspection of living conditions and method of handling milk and other food supply. A more careful method of collecting and disposal of garbage.

3. Also to condemn all wells found to have water not safe for drinking purposes.
4. To make a complete sanitary survey with special emphasis on location and character of wells and privies so as to have complete data for working purposes. With this on hand, it will be a simple matter to abandon all the wells and privies in locations where city water and sewers now are, or to do the same when they are installed in streets that now do not have them.
5. To clean up Indian Creek and if possible to divert its channel so that it will not discharge as it does at present on the flat portions of the city.

And finally—

6. To institute a propaganda of public health instruction as to fly eradication and as to general hygienic measures in order to clean up the city.

ARTHUR L. GROVER,
Acting Epidemiologist.

Approved. HENRY ALBERT, *Director.*

SANITARY SURVEY.

The sanitary survey of Council Bluffs undertaken in connection with the investigation of the 1914 typhoid epidemic included the investigation of the public water supply at Council Bluffs, the field tests of wells, a study of sewer districts and sewer systems, the investigation of sewage and garbage disposal and a survey of the city relative to sanitary conditions in general.

Through the courtesy of the City Engineer of Council Bluffs, maps of Council Bluffs were obtained, upon which were shown the location of wells examined and the location of the typhoid cases. The various sewers of the city were located upon the map in accordance with information furnished us by the City Engineer. There were also shown upon these maps the principal water mains and water mains additional to the water mains which supply the sewers. There is a considerable mileage of two inch and four inch laterals leading from the regular water mains and supplying the territory supplied by sewers. There are also some of these two inch and four inch lines supplying territory not yet sewered.

PUBLIC WATER SUPPLY.

In the report of Dr. Grover, is shown a tabulation, giving the use of city water and well water. It will be seen by this tabulation that it is quite difficult to base any prediction as to the source of the epidemic on these facts. It seems to be necessary to investigate the character of the water used. It is likely true that nearly all of the people attacked by typhoid fever during this epidemic had access to, and did use well water to some extent.

The several investigators employed in this investigation agree as to the character of the public water supply, and also agree in the conclusion that the public water supply was in no way responsible for the origin and distribution of the typhoid infection. The water supply of Council Bluffs is

taken from the Missouri River. The coagulation and settling basins have a capacity of eight million gallons. The storage reservoirs at the pumping station are credited with a capacity of twelve million gallons, and the glendale reservoir in the eastern part of the city has a capacity of four and one-half million gallons. The water taken at the intake is subjected to coagulation and detention to allow subsidance. This water flows by gravity to the pumping station. At the pumping station the water is sterilized by chlorination. A laboratory in charge of Mr. Joseph B. Thornell is maintained at the pumping station, and regular bacteriological tests are made daily. Chemical tests are made as frequently as the conditions demand. A review of the reports of this laboratory from May, 1914, throughout the remainder of the year indicate an excellent condition of the water as stated in the report of Dr. Grover. These reports indicate that there is no probability of the typhoid infection having been transmitted by the city water.

WATER SUPPLY FROM PRIVATE WELLS.

There are supposed to be about 800 private wells in use in Council Bluffs. These are perhaps all shallow wells. Some of them are driven wells and some are dug wells. Some are old wells and some are new wells. Investigations that have been made from time to time indicate that it is hardly possible to obtain a safe water supply from private wells in a city or town. In almost every town where we have tested all of the wells of the town we have found more than one-half of such wells unfit for use. It could hardly be expected that the water of the private wells in Council Bluffs would be safe water to use without boiling, or without some form of sterilization.

The Health Officer was no doubt correct in his judgment about the wells located at the intersection of Frank street and Broadway, and was fully justified in condemning the same and preventing the use of the water of these wells. At the time of this investigation the Frank street wells had been put entirely out of commission and it was not possible to obtain later samples for analysis. Therefore, the analyses made by Mr. Thornell are accepted and made use of in the foregoing report.

Mr. Gharrett Jordan, assistant to Dr. Albert, was instructed to make a complete chemical analysis of all wells suspected as having been infected during the time of the epidemic, and also to make bacteriological examination of the water of such wells, and nine such wells were so examined. He was instructed to make field tests of a sufficient number of the other wells in use to determine the character of the underflow of ground water supplying these wells. In such investigation he made the field tests of ninety-nine wells.

The field tests represent about one-eighth of the entire number of wells in use.

Of the ninety-nine wells examined, thirty-one were found to be *bad*, forty-seven were found to be *suspicious*, and twenty-one were classified as *good*.

This classification means that seventy-eight of the wells examined were unfit, and probably unsafe, for use. Of the twenty-one wells classified as

good, the greater number are new wells, and several of these under the existing conditions would become unfit for use in the near future. The chances are that not more than ten per cent of the shallow wells in use in the city should be considered safe, and the probability is that a still lower percentage would be a safer estimate.

Another fact to take into consideration is that at the time Mr. Jordan made these examinations the underflow water would be in its best condition, or approaching such condition, for the reason that the surface impurities which find their way into shallow wells throughout the open seasons of the year were frost locked, and therefore would not percolate into the common underflow. Evidently the showing given, while bad enough to cause the condemnation of a large proportion of the wells, is a better showing than might be made at some other season of the year.

The report of the chemical and bacteriological analysis made by Mr. Jordan are appended. So far as the wells are connected with the typhoid epidemic the case numbers have been indicated. It will be understood that this notation does not indicate the number of typhoid patients who used well water, but simply indicates the cases that made use of well water at their homes. There is also a report of analysis made of water at dead ends of water mains, but no special significance can be attached to the findings there given. Dead ends of water mains should be frequently flushed to rid the mains of algae growth, which always occurs under such conditions.

The report of analysis follows:

Abbreviations:—

af=animal forms, a=algae, c=colorless, b=brown, a=green, Fe=iron. sm=small, cons=considerable, sl=slightly.

Determinations	Well No. 100	Well No. 102	Well No. 101	Well No. 103	State Standards for Shallow Wells Parts per Million
Turbidity	None.	None.	Some.	Cons.	
Sediment	None.	None.	None.	None.	
Nitrogen as free ammonia	.02	.056	.672	.184	.0250
Nitrogen as nitrites	.00025	.00010	None.	None.	.00010
Nitrogen as abl. ammonia	.08	.976	.08	.118	.1750
Nitrogen as nitrates	2.40	.20	3.0	.150	.7500
Chlorides	15.1	41.0	5.0	10.5	3.50
Phosphates					1.75
Residue on evaporation	556.	843.	434.	694.	350.00
Volatile solids					
Fixed solids					
Color and odor on ignition	None.	None.	None.	None.	
Microscopical				Fe. present.	
			Cons. Fe. present in sample		
Bacteriological					
Remarks	2102 Ave. E. Dug 3½'x18'. Age 28 yrs. Privy 50'. Cess pool 70'.	1320 2nd Ave. Dug 3'x20'. Age 2 yrs. Privy 75'.	1002 S. 35th Driven 50'. Age 7 yrs. Privy 50'	2639 5th Ave. Driven 25'. Age 7 yrs. Privy 30'.	

Determinations	Well No. 104	Well No. 105	Well No. 106	Well No. 107	State Standards for Shallow Wells Parts per Million
Turbidity	None.	Slight.	Decided.	None.	
Sediment	None.	Slight.	Consid.	None.	
Nitrogen as free ammonia	.016	.771	.011	.016	.0250
Nitrogen as nitrites	.00015	.00030	.00015	.00015	.00010
Nitrogen as alb. ammonia	.040	.096	.188	.040	.1750
Nitrogen as nitrates	1.540	.150	1.50	1.250	.7500
Chlorides	8.0	13.2	9.5	13.5	3.50
Phosphates					1.75
Residue on evaporation	398.	440.	440.	1,006.	350.00
Volatile solids					
Fixed solids					
Color and odor on ignition	None.	None.	Slight.	None.	
Microscopical					
Bacteriological					
Remarks	124 Hunter, dug 3'x 96'. Age 5 yrs. Privy 75'.	128 Hunter, dug 3'x 100'. Put in an iron pump 12-7-14, previous to that it was an open well. Sample taken after the iron pump was put in.	1555 Madison. Dug 3'x60'. Age 36 yrs. Privy 75'. Open well. Use water from well at 1513 Madison.	1418 N. 8th. Use water from well at 1115 N. 8th St. Dug 3'x20'. Age 14 yrs. Privy 75'.	

Determinations	Well No. 108	Well No. 109			State Standards for Shallow Wells Parts per Million
Turbidity	None.	None.			
Sediment	None.	None.			
Nitrogen as free ammonia	.012	.056			.0250
Nitrogen as nitrites	.00025	.00400			.00010
Nitrogen as alb. ammonia	.072	.200			.1750
Nitrogen as nitrates	1.940	7.800			.7500
Chlorides	165.0	120.0			3.50
Phosphates					1.75
Residue on evaporation	1,316.	1,103.			350.00
Volatile solids					
Fixed solids					
Color and odor on ignition	None.	None.			
Microscopical					
Bacteriological					
Remarks	1402 I. Dug 3'x?. Privy 75'. Very poor board top.	I Ave., sw. cor. H I. Dug 3'x20'. Age 1 yr. Privy 50'.			

BACTERIOLOGICAL EXAMINATIONS AT COUNCIL BLUFFS, IOWA. Nov.-DEC. 1914.

			Lactose Litmus Agar incubated at 37 Plain Agar incubated at room temperature.			Formation tubes.		
No.	Source	Date 1914	Bacterial count. Colonies per c.c. Room tem.	Bacterial count. Colonies per c.c. at 37° C.	Acid Colonies at 37° C.	Vol. in c. c.	% of gas in 24 hrs.	% of gas in 48 hrs.
100	Well, 2102 Ave. E, Case No. 48	11-23-14 P. M.	1,200	75	4	1	25	30
101	Well, 1002 S. 35th. Case No. 52	11-24-14 P. M.	4	10	------	1	--------	-------
102	Well, 1320 2d Ave. Case No. 37	11-24-14 P. M.	200	32	1	1	10	10
103	Well, 2639 5th Ave.	11-24-14 P. M.	100	100	------	1	--------	-------
104	Well, 124 Hunter. Cases No. 26, 27, 38	11-24-14 A. M.	225	10	------	1	--------	Trace
105	Well, 128 Hunter, Case No. 46	11-24-14 A. M.	2,000	16	2	1	10	30
106	Well, 1513 Madison. Case No. 9	11-24-14 P. M.	560	20	2	1	10	10
107	Well, 1415 North 8th. Case No. 20	11-24-14 P. M.	150	10	------	1	Trace	5
108	Well, 1402 Ave. I. Case No. 57	18-7-14 A. M.	1,500	380	*40	1	--------	-------
109	Well, N. W. Cor. I and 17th	12-7-14 A. M.	1,800	41	------	1	--------	5
110	Cases No. 3, Mother and son.	---------	--------	--------	------	------	--------	-------
111	Dead end of water main. 9th Ave. and 24th St.	12- 2-14 A. M.	50	4	------	1	--------	-------
112	Dead end of main. Fairmount Park	12 -2-14 A. M.	8 Spreaders.	8	------	1	--------	-------
113	Dead end of main. 22d St. and Ave. G	12-2-14 A. M.	14 Spreaders.	6	------	1	--------	-------
114	Dead end of main. Lincoln Ave.	12-2-14 A. M.	55	11	------	1	--------	-------
115	Dead end of main. North 1st.	12-2-14 A. M.	13	2	------	1	--------	-------
116	Sample of milk from milk supply of the Creche, 723 E. Pierce. (Orphan Asylum.)	12-2-14 P. M.	250,000	72,000	1,200	1	10	**15

*No typical B Coli Colonies.
**Ratio of gas 3:1::H_2 CO_2.

SEWER SYSTEM.

The peculiar topography of Council Bluffs has made the sewer problem rather difficult. Prior to the enactment of legislation relative to outlet sewers, enacted by the 35th General Assembly, it was practically impossible to furnish sewer facilities to the low lying portions of the western part of Council Bluffs. This survey indicates that a large proportion of Council Bluffs has been deprived of sewer facilities until quite recently, and that there yet remains the problem of building the necessary lateral sewers to supply such facilities.

An examination of the map furnished us by the superintendent of the water works, showing the water distribution system, indicates that in times past an unsatisfactory method was employed in the distribution

of water mains. A considerable part of that portion of Council Bluffs now supplied with sewers appears to have been supplied with water by very small water pipes. The writer has no information upon the manner of doing this, but an examination of the map warrants the assumption that in many instances the water supply was furnished to the residences of the people through private connections or extensions, rather than by the extension of street mains in the regular way. If this assumption is true it would account for the fact that many residences in the older part of the city supposedly well supplied with sewer facilities have not been connected up with the sewer.

The further examination of the water map shows the existence of a considerable mileage of two inch and four inch water pipes in other portions of the city where sewers have not yet been built. This would seem to indicate an insufficient water distribution in such localities. So far as the writer knows, this condition of affairs relative to the distribution of the water supply is chargeable wholly to the management of the Water Company prior to the time the water works were purchased by the city of Council Bluffs. The installation of the main outlet sewer on Sixth Avenue, and laterals from this main sewer already constructed indicate satisfactory sewer facilities for the future.

SEWAGE DISPOSAL.

The lack of sewer facilities in previous years has perpetuated the use of the common outdoor closet. The usual conditions were found existing, and such conditions have no doubt contributed somewhat to the perpetuation of typhoid fever in Council Bluffs.

The outlet sewers of the old system have emptied into Indian Creek at points in the south part of Council Bluffs. The sewage thus entering Indian Creek finds its way into the Missouri River except in times of overflow, when the low lands were receiving more or less of such sewage by reason of such overflow. The new outlet sewer is provided with pumping facilities by which the sewage is elevated to a sufficient height to be discharged into the Missouri river. Certain connections have been made between the old sewer system and the new outlet sewer, so that a considerable proportion of the sewage at Council Bluffs now passes to the new outlet sewer, and the writer is informed by the City Engineer that all of the sewage of Council Bluffs may enter the new outlet sewer when certain proposed changes in the old sewer system have been made, which changes are entirely feasible.

GARBAGE AND REFUSE DISPOSAL.

The problem of garbage and refuse disposal has not been satisfactorily solved in any city or town in Iowa, and it might be stated that the problem has not been satisfactorily solved in many cities in this country. No unusual conditions relative to the accumulation of garbage are especially noted in Council Bluffs.

If it were generally understood by Local Boards of Health that at least half of the contamination of shallow wells is probably due to that type of surface refuse and filth generally spoken of as garbage, such

Boards of Health would undoubtedly be more insistent in the disposal of garbage. Until the problem is considered as an absolute necessity, involving the outlay of a sufficient amount of money to install some proper method of garbage disposal, and to inaugurate a regular system of garbage and refuse collection and disposal, incomplete disposal by crude methods must be depended upon. While depending upon crude methods an extra amount of care and oversight is needed to accomplish fairly good results.

GENERAL SANITARY CONDITIONS.

A study of the topography of Council Bluffs indicates the extreme difficulty of maintaining satisfactory conditions. The eastern portion of Council Bluffs is built in and upon bluff territory. A rainfall in this region flows precipitately into the ravines, finding exit quickly, and for the greater part, into Indian Creek. Whatever surface contamination may be due to the waste products of animal life and to the leachings from garbage heaps, or the offal of barns, or from whatever source, runs quickly from this elevated and precipitous territory down through or upon the low lands. The history of Indian Creek is better known to the people of Council Bluffs than it is to the writer, and it is not necessary to include such history in this report.

It is evidently true that the low lands bear not only the burden of their own accumulating surface wastes, but in great degree bear the extra burden of the wash from the hill country. The topography indicates that the rainfall upon the low lying territory runs off very sluggishly, if at all, under ordinary conditions. This means that the waste products of animal and vegetable life constantly accumulate in this flat territory, and continually contaminate the underflow of water by reason of the percolation of the surface wastes carried downward by the rainfall, only a small portion of which becomes run-off water. It will thus be seen that the natural difficulties of maintaining satisfactory sanitary conditions are particularly heavy in this locality, and such conditions call for extra vigilance on the part of the Local Board of Health.

Added to the above conditions is the additional fact that the peculiar location of Council Bluffs subjects it to the added load of waste products incident to the heavy interstate traffic, which brings in to the city a transient population constantly, thus multiplying the possibilities of disease transmission as well as contributing directly to the difficult problem of the successful disposal of surface wastes of the most dangerous character.

SUMMARY.

The information furnished by the sanitary survey and the epidemiological investigations warrant certain conclusions and recommendations. The conclusions and recommendations given are in part a rewriting of the conclusions and recommendations made by Dr. Grover. Dr. Grover's conclusions and recommendations and any additional recommendations given in this report follow a conference held by Dr. Grover and the Sanitary Engineer after the investigations had been completed, and such conclusions and recommendations as are here appended are conclusions reached by us in common.

CONCLUSIONS.

1st. That the existence of typhoid fever in Council Bluffs has been caused principally by the use of contaminated water from shallow wells.

2d. That the infection of the water of the shallow wells at various times has most probably been caused by.

(a) Open privies infected by typhoid carriers, the seepage from such privies finding access to the water supply of the wells.

(b) The possible infection of underflow water by surface filth containing the waste products of human beings, whether such waste products have been of local accumulation, or from the surface washes of nearby open privies, or the result of the washing of the hill country overflowing Indian Creek.

3d. That, in some degree, flies have carried the typhoid germs from open privies to the food supply of adjacent houses.

4th. That flies and possibly rats may have carried the infection from the filth and garbage lodged in Indian Creek to neighboring houses.

RECOMMENDATIONS.

The recent investigations warrant the following recommendations:

1st. More rapid extension of sewers and water mains. It should be understood that there is only one economical method of disposing of sewage and that is by means of properly constructed sanitary sewers. The proposition of extending the water mains throughout the inhabited territory of Council Bluffs should be financed at the earliest possible time. If present ordinances operate to delay the installation of water mains, some modification of the ordinances should be made, so that the city water will be available to all of the citizens. This recommendation is not carelessly made, but is made with a full understanding of the financial conditions involved, but it is also made with the knowledge that human life must be protected, and that such protection is paramount to any other question or condition affecting your people.

2d. Wherever sewer and water facilities exist the abutting and adjacent property owners should be required to connect their property with the sewer, and install city water supply.

3d. As an immediate precaution there should be maintained a more rigid sanitary inspection of living conditions and methods of handling milk and other food supplies.

4th. There should be devised and maintained a more complete and careful method of collecting and disposing of garbage and other refuse.

5th. The City Council, or local Board of Health, should provide for a complete sanitary survey with special emphasis on location and character of wells and privies, so as to have complete data for working purposes. The local Board of Health should require complete maps of the city showing such information. Such maps could be prepared by the engineering department of the city. The local Board of Health should provide the city chemist with sufficient help and facilities to field test all of the private wells used in the city, for the purpose of showing the extent of the contamination and infection of such wells.

6th. All wells found to have water not safe for drinking purposes should be condemned and permanently closed.

7th. Where it is necessary to continue the use of outdoor closets, pending the installation of sanitary sewers, such closets should be built fly-proof and maintained in a sanitary condition. The vaults of such closets should be cleaned twice each year, or oftener if found necessary. The contents of such vaults should not be disposed of in a careless manner, common in ordinary scavenger work, but should be removed to some remote location, which complies with the requirements of the statutes, and disposed of by burial or chemical treatment or both. The vaults when properly cleaned should be carefully disinfected. A rigid inspection of the outdoor closets, and perfect compliance with the regulations, should be required.

8th. The diversion of Indian Creek by some one of the plans proposed should be accomplished in the near future; that of diverting this stream to the northward would seem to be the most feasible proposition. Such a scheme would relieve the low lands of the extra burden of surface wash from the hill country, and minimize the dangers resulting therefrom.

9th. To make an increased appropriation for the use of the Health Department of the city, whereby additional inspectors may be employed, and additional corrective measures may be instituted.

10th. To institute a propaganda of public health instructions as to fly eradication and as to hygienic measures in order to clean up the city.

In rendering this report we do not understand that our work is necessarily finished in Council Bluffs, neither do we understand that the filing of this report will meet with universal approval on the part of your people. We therefore urge upon you the necessity of taking rigid measures to enforce the recommendations herein made, realizing that it will hardly be possible to free Council Bluffs from typhoid fever unless all possible sources of typhoid transmission are eliminated.

We desire especially to commend the effort now being made by Council Bluffs to supply the city with a safe and satisfactory public water supply. The efforts of the Superintendent to make the water supply more extensive and efficient should be appreciated by the people of Council Bluffs, and the more complete financing of the water project should be provided as rapidly as it is legally possible to do. Since it is concluded that the chief cause of the perpetuation of typhoid fever in Council Bluffs is the use of contaminated private wells, the remedy lies in a sufficient provision for the individual use of the public water supply, and the discontinuance of the use of private shallow wells.

With these recommendations this report is submitted to you with the desire that you follow out the recommendations herein made, and with the assurance that the State Board of Health will further co-operate with you in any efforts to better the sanitary condition of your city.

LAFAYETTE HIGGINS,
Civil and Sanitary Engineer,
Iowa State Board of Health.

To the Mayor and City Council of Council Bluffs, Iowa.

Gentlemen:

I have carefully examined the reports of the Sanitary Engineer of the State Board of Health, of Mr. Jordan, Assistant in the State Board of Health Laboratory, and Dr. Grover, Acting Epidemiologist, relating to recent surveys of, and the perpetuation of typhoid fever in, Council Bluffs, Iowa, and I hereby approve the findings and recommendations of said reports.

Very respectfully yours,

GUILFORD H. SUMNER,
Secretary-Executive Officer,
Iowa State Board of Health.

Note: The recommendations contained in the foregoing report have been partially carried out. The typhoid rate in Council Bluffs following the epidemic and the investigation of the same was reduced sixty-seven per cent or to practically one-third of the typhoid rate before the investigation was made. Since typhoid had recurred annually in Council Bluffs for many years prior to the investigation, it is fair to assume that the reduction of the typhoid cases to practically one-third of the annually recurring number of cases is due to the efforts of the local board of health and health officer in carrying out the necessary sanitary regulations as determined by the results of the investigation made by the health officer at Council Bluffs, and by the recommendations of the State Board of Health.

SANITARY SURVEY AND INVESTIGATION OF TYPHOID EPIDEMIC OF ADEL, 1914-1915.

During the month of November, 1914, an epidemic of typhoid fever occurred in Adel. The occurrence of the epidemic was so sudden, and the conditions attending such epidemic so peculiar that the investigation of the epidemic undertaken by the State Board of Health was made much more complete than usual, and a complete sanitary survey of the town was included in the investigation.

The investigation was begun in December, 1914, continuing through July, 1915. The final report was purposely deferred until July, 1915, in order to include any possible recurrence of the epidemic during the spring of 1915.

The following report of the epidemiological investigation was made to the Secretary of the State Board of Health:

Dr. G. H. Sumner,

Iowa State Board of Health.

A report of the investigations and findings relative to the epidemic of typhoid fever at Adel during the months of November and December, 1914, is herewith submitted:

The history of this typhoid epidemic may be very briefly stated. On the fifth day of November, 1914, a social was held under the auspices of

the Ladies' Aid Society, at the home of Mr. and Mrs. T. J. Wilkins at Adel at which a supper was served. The company attending this function was made up principally of adult people and included a number of people well advanced in age. A few young people were present and a very few small children.

Within a few days after this function was held a large proportion of the people who attended the function and ate at the supper were attacked by typhoid fever. There were present about forty-eight persons who partook of the supper.

The principal articles of food served at this supper were creamed potatoes, cabbage slaw containing whipped cream, chicken sandwiches, which included cream in the preparation of the chicken, canned strawberries, cake and coffee. The articles of food which appear to have been eaten by all present were the creamed potatoes and the chicken sandwiches. The canned strawberries were eaten by about all of those present except two of the small children, and these children were attacked by the fever. The cabbage slaw was eaten by nearly everyone present, but was not eaten by two of the victims of the fever.

The epidemiological history of all of the typhoid cases has been secured for the purpose of this report, but such history is not complete in some particulars, though not lacking in the essentials of such history.

The town of Adel had been remarkably free from typhoid fever in years past, and at no time had anything occurred that could be thought of as an epidemic of typhoid fever. At the time of this recent outbreak of typhoid fever there had been no typhoid fever in Adel for a long period of time, and during this outbreak there were no cases of typhoid fever that were not directly traceable to infection received at the supper given on November 5th. The subsequent history of this outbreak furnishes no typhoid cases except those directly traceable to the supper, and two contact cases resulting from association with, or care of, epidemic cases.

The following table furnishes essential and sufficient data upon which to base any findings or conclusions as to the character of the outbreak. The table is not quite complete in all particulars, because the investigation of the cases was made December 19th before the recovery of many of the patients, and also because a complete clinical history of all the cases was not available.

LIST OF CASES OF TYPHOID CAUSED BY INFECTION RECEIVED AT THE SUPPER HELD ON NOVEMBER 5, 1914, AT THE HOME OF T. J. WILKINS.

No.	Name	Age	Date of first symptoms	Date took to bed	Date of recovery	Remarks
1	Mrs. C. E. Merchon	34	11-10-14	11-18-14	Continuing	
2	Hazel Ferguson	25	11-12-14	11-19-14	12-20-14	
3	Mrs. Fred Macy	29	11-14-14		1- 4- 5	
4	Mrs. W. E. Silver	32	11-15-14		12-31-14	
5	Mrs. E. W. Dingwell	43	11-13-14	11-19-14	*	
6	Wilbur Dingwell	4	11-15-14	11-19-14	Convalescent	
7	Mrs. C. S. Macy	30	11-17-14	11-20-14	12-20-14	
8	Dorothy Macy	3	11-17-14		12-21-14	
9	Mrs. Dr. Koen	30	11-19-14	11-21-14	12-15-14	
10	Mrs. W. Van Fossen	63	11-15-14	11-24-14	Continuing	
11	Le Vern Crowder	12	11-15-14	11-24-14	Continuing	
12	Walter Wilkins	2	11-18-14	11-24-14	12-15-14	
13	Mrs. Ole Johnson	30	11-20-14		12-27-14	
14	Malissa Snyder	50	11-20-14	11-24-14	12-16-14	
15	Mrs. H. B. Heston	45	11-20-14	11-24-14	Convalescent	
16	Mrs. F. D. McKay	50	11-23-14	11-25-14	Convalescent	
17	Mrs. Crowder	40	12- 1-14	12-10-14	Continuing	Contact case
18	Walter Bonnewell	22	1- 5-15	1-10-15	**	Contact case

*Date of death 12-11-14.
**Date of death 1-26-15.

POSSIBLE SOURCES OF INFECTION.

First, *Water supply.* The water used in the preparation and serving of the supper was city water. No well water whatever was used. The water must be eliminated as a source of infection for the reason that all examination of the water, both chemical and bacteriological, shows the water to be safe and free from any contamination or pollution that would make possible the existence of typhoid bacilli in the water. A further reason for eliminating the water lies in the fact that there was no distribution of typhoid throughout the town, except such cases as received the infection at the supper, the distribution of which cases bears no relation whatever to the distribution of the public water supply.

Second, *Food Transmission.* The epidemiological history of the cases as shown by the preceding table, which indicates a very short prodromal period, and the extremely explosive character of the outbreak, taken together with the fact of the very high proportion of cases resulting as compared with the number of persons who ate of this supper, all indicate a food transmission of typhoid bacilli of a highly virile type.

Various speculative opinions were given as to the possibilities of food transmission. The cabbage slaw was suspected but the laboratory examination of the cabbage did not reveal the presence of typhoid bacilli and two of the persons receiving the infection did not eat the cabbage slaw. This apparently eliminates the cabbage as the source of infection, but would not eliminate the milk or cream which was used in the preparation of several of the foods. The canned strawberries were suspected, but the laboratory examination of the strawberries did not reveal the

presence of typhoid bacilli, and two of the younger children who received the infection did not eat strawberries. The strawberries therefore seem to be eliminated as a source of the infection.

The creamed potatoes were eaten by all who ate at this supper and there was full opportunity for the transmission of typhoid bacilli if the same existed in the milk or cream used in the preparation of the creamed potatoes. It is barely possible that the cream used in the preparation of the potatoes was sufficiently cooked to destroy the typhoid bacilli, but there would seem to be a probability that the typhoid bacilli were not thus destroyed.

The chicken sandwiches which were eaten by all who ate at this supper appear to furnish a probable source of infection in this particular epidemic. The chicken used in the preparation of the chicken sandwiches was prepared about as follows. The chicken was prepared the day before the supper by being boiled. It was then placed in an earthenware vessel and covered. On the day of the supper the broth of the chicken was taken and made into a gravy using cream. Very little cooking was done and certainly not enough to destroy typhoid bacilli if the same were in the cream. The chicken was picked apart into small pieces with the fingers, mixed with the gravy and then used in the preparation of the sandwiches A careful study of all of the facts warrants the conclusion that the infection was most probably transmitted by the chicken sandwiches. This conclusion raises the question whether the typhoid bacilli, which were evidently greatly multiplied and enriched by the food as a medium, came into this food through the milk or from a carrier. It was at first suspected that the one who prepared the chicken for the sandwiches might be a typhoid carrier, but subsequent laboratory tests failed to prove that this person was a carrier. Since this person was the only one who handled the chicken, in its preparation, early enough to have allowed the necessary culture period, it is reasonable to conclude that the chicken itself was not the culture medium. This leaves the one possibility and probability that the infection was brought into the food through the milk or cream.

The further history of the case shows that the cream used in the preparation of all the foods, where such was needed, was brought from the farm belonging to Mr. Wilkins. This cream was from milk gathered the preceding day, perhaps in the evening, and the time of milking must have been nearly twenty-four hours prior to the time of the supper. Conceding that in some manner the typhoid bacilli may have entered the milk at the time of milking we have the conditions essential for the culture and transmission of the typhoid bacilli. The history further shows that the milk or cream was placed in the basement of the farm home where the temperature was moderately low, and that when the cream was removed and brought to the town residence where the supper occurred it was placed in a cool location until perhaps two hours before it was used in the preparation of the chicken for the sandwiches. During this latter interval it was exposed to the temperature of the kitchen.

If we consider that some slow development would occur during the many hours the milk was a moderately low temperature, and that a rapid development occurred when the cream was subjected to room temperature or to the temperature of the heated kitchen, we perhaps have a sufficient culture period to account for the production of the active, virile bacilli which evidently existed in this infection.

This leads us to the conclusion that the infection was a milk-borne infection.

It was thought best, however, to make a thorough laboratory investigation for typhoid carriers. Dr. Henry Albert, the Director of the Bacteriological Laboratory of the State Board of Health, detailed Dr. C. L. Bartlett to make this investigation.

All of the people who had anything to do with the handling of the milk or the preparation and serving of the supper, except two of the ladies who took the fever coincident with the other cases, were tested as indicated in the appended report of Dr. Bartlett. All of these people, on repeated examinations, were found negative except one lady, where the examinations were positive at the time all of these first examinations were made. This lady by subsequent examinations about five weeks later proved negative. This lady had little to do with the supper, nothing more than passing the plates. Futrher than this the Health Officer found by investigation that this lady suffered the preliminary symptoms coincident with the other cases of typhoid, though she did not come down with the fever. It is also true that she had the same opportunity to receive the infection as the others, and at the time the examination was made she undoubtedly had not recovered from such infection, but at the time of the later test had probably recovered. There seems to be no reason for believing that this lady was in any way responsible for the infection. It may also be noted that any infection that might have been transmitted by a carrier who only helped to serve the supper would not have been an infection by cultured bacilli, such as the infection that actually occurred.

REPORT OF DR. C. L. BARTLETT.

Iowa City, Iowa, January 4, 1915.

Dr. G. H. Sumner,

State Board of Health,
Des Moines, Iowa.

In response to your request made through Dr. Henry Albert, Director of the State Board of Health, Bacteriological Laboratories, I went to Adel, Ia., on December 19, 1914, to make the required bacteriological examinations in connection with the investigation then going on in connection with the outbreak of typhoid fever.

Upon my arrival there, I met Professor Higgins and through him, Dr. C. E. Mershon, the local health officer. In our conference we decided to establish my working basis at the Court House. I had shipped to Adel laboratory apparatus sufficient to do the first plating, incubating and making the primary isolations. This apparatus, however, did not arrive until Monday, December 21, and I did not make my first plates until Monday afternoon.

Following the request of Professor Higgins and Dr. Mershon I examined the feces and urine of five people, from whom, according to the data already gathered by Professor Higgins, we might expect to obtain the desired information. These individuals I recorded by letter and have attached to this report a list of their names with the corresponding letters. Two samples of water from the Wilkins farm, one sample of water from the Wilkins town residence, and one sample of milk from the town place were also examined.

The primary plating on Endo's media was done at Adel and the further study of the isolated organisms carried on at the State Board of Health laboratories at Iowa City. After carrying them through the standard media I found that organisms isolated from subject "I" show the following morphological and cultural characteristics:

Morphology	gram negative bacillus.
Motility	actively motile.
Endo's media	colorless colonies.
Litmus lactose agar	blue or light violet colonies.
Hiss' semi-solid	no liquefaction-motility.
Dunham's peptone	no indol produced.
Lactose bouillon	no gas.
Milk litmus	no change.
Dextrose litmus broth	acid—no gas.
Dextrin " "	" " "
Lactose " "	alkaline—no gas.
Galactose " "	acid—no gas.
Mannit " "	" " "
Sacchorose " "	alkaline—no gas.
Levulose " "	acid—no gas.
Neutral red broth	not reduced.
Widal reaction with dilution of serum 1	50 complete clumping.

From the above data I therefore conclude that the organism in question is Bacillus typhosus. Although the epidemiological investigations seemed to point to subjects A and C as possible carriers, I can find no positive evidence leading to such a conclusion.

I find in the farm well water evidence of contamination by execreta evidenced in both samples by the presence of B. Coli. The city water supply is potable.

I found no B. typhosus in the particular sample of milk examined. It must be remembered, however, that the absence of B. typhosus in the milk at the time this examination was made would be no indication that B. typhosus had not been present in the milk some time previously, or at the time when this infection was received.

LIST OF THE SERIAL LETTERS AND CORRESPONDING NAMES OF THOSE EXAMINED.

A	Mrs. Guss Wilkins	Feces
B	Mrs. Guss Wilkins	Urine
C	Mrs. T. J. Wilkins	Feces
D	Mrs. T. J. Wilkins	Urine
E	Mrs. T. J. Wilkins	Feces
F	Mrs. T. J. Wilkins	Urine
G	Mrs. Guss Wilkins	Feces
H	Mrs. Guss Wilkins	Feces
I	Mrs. Harper	Feces
I-X	Mrs. Harper	Feces
J	Mrs. Harper	Urine
K	Mrs. Guss Wilkins	Feces
L	Mrs. T. J. Wilkins	Urine
M	Mrs. T. J. Wilkins	Feces
N	Mrs. Guss Wilkins	Feces
O	Mrs. T. J. Wilkins	Feces
P	Mr. Guss Wilkins	Urine
Q	Mr. T. J. Wilkins	Urine
W. & W. 1		Water
Milk		Milk

I wish in conclusion to thank the doctors and others concerned in this investigation for their valuable aid.

C. L. BARTLETT.

Approved: HENRY ALBERT, Director.

There is here appended the last report of the examination made by Dr. Bartlett relative to the one person who had proved to be a carrier at the time of the investigation:

February 2, 1915.

Professor Lafayette Higgins,
Des Moines, Iowa.

I have made a bacteriological examination of a specimen of feces from Mrs. Harper which Dr. Mershon of Adel sent to this laboratory about a week ago, but have been unable to find typhoid bacilli. This does not, of course, mean that Mrs. Harper is no longer a typhoid carrier, since it frequently happens that carriers discharge the specific bacilli intermittently.

C. L. BARTLETT.

Approved: HENRY ALBERT,
Director State Board of Health Laboratory.

[NOTE: Additional facts furnished by the Health Officer show that Mrs. Harper probably suffered a mild attack of the disease. The prodromal symptoms appeared coincident with the other cases, and it would appear to be true that the final test made by Dr. Bartlett indicated her recovery from such infection.—L. H.]

It would appear from the preceding history of the epidemic and from the results of the investigation that the Adel epidemic is clearly a milk-borne epidemic.

While the epidemiological history may lead us all to this same conclusion as to the immediate cause of this outbreak, when we have reached our conclusion we have reached the point where the greatest difficulty occurs in reaching the final conclusion as to the original source of the infection. The real facts of the infection of the milk may never be known, but there are two possibilities or opportunities for such infection.

First. Referring to Dr. Bartlett's report we find that he states that he made two examinations of the farm well water at the Wilkins farm and found evidence of contamination by excreta. The history of these two examinations, as given subsequently by Dr. Bartlett, shows that the first sample of the farm well water was so highly contaminated that the number of colonies of B. coli was exceedingly high. It appeared, however, that the sample of water furnished him for the first analysis was taken from the farm water tank located near the well, and in which the water would stand from day to day and be subjected to contamination that might not be present in the well itself.

The second sample, however, was taken directly from the well after continued pumping, and presumably represented the real character of the water of the well. This second sample was not so highly contaminated as the first sample, but still contained B. coli in large numbers.

The accompanying map of the southwest quarter of Adel Township, Dallas County, Iowa, which was traced from the Dallas County Atlas, shows the location of the Wilkins farm, the residence thereon, and the relation of this farm to the North Raccoon River and the mill slough or cut-off. The map is too small to show in detail the location of the Wilkins residence, and the Wilkins farm well to the farm buildings. The well is located near the highway at a considerable distance from the residence and in the barnyard at a reasonable distance from the barn and other farm buildings. This farm well is favorably located and is about 96 feet in depth. It is a bored well or tube well. Very little barnyard drainage flows toward the well, and so far as could be noted, no surface flow passing outside toilets reaches the well. The well is equipped with a well built cement platform, and the pump pit is also cemented. This protection to the well was provided during the summer of 1914, the exact date not being obtainable.

It is hard to see how human contamination could reach the water of this well through surface wash or percolation. According to the statement of Mr. Guss Wilkins the water of this well is within 40 feet of the surface of the ground, and sometimes higher. A study of the location would suggest that there was a possibility that as this well extended below the water level of the mill slough, it might under certain conditions, be drawing a part of its water supply from seepage through the flat bottom at the base of the hill adjacent to the mill slough. If such a condition existed, the presence of B. coli in the water could be accounted for as originating with barnyard drainage or waste products of animal life, which by seepage or percolation could so find entrance into the underground water furnishing the water supply. If this condition did not exist, we could only account for the presence of B. coli in the water of this farm well through surface seepage or percolation of surface water or rain water picking up the surface impurities of the barnyard and carrying the same into the well. Such a result would be possible, because this tube well is not protected against surface percolation, or seepage, which could find its way below the cement platform and pump pit. In other words, the well tube is loosely placed in the earth and at different times has been removed to make necessary repairs, as is usually the case with such farm wells.

It is a well known fact that practically all of such wells show surface contamination, apparently because seepage, or surface water, readily drops downward through the apperture made in boring the well, and on the outside of the well tube.

The presence of B. coli in water of the well indicates contamination by excreta, produced by animal habitation, either human or domestic, and must have been transmitted to the water either from the surface of the barnyard, or the surface of the low lying bottom or pasture lot adjacent to the mill slough. Whatever might have been the surface contamination of the barnyard, such contamination would, in small measure, be carried to the well itself in the manner indicated, or in much greater measure carried to the low lying land before described, for the reason that the barn and other farm buildings and the greater part of the barnyards are so situated that the surface wash from such buildings and barnyards would, in great measure, be deposited as surface wash upon the low lying ground before mentioned.

If the typhoid bacilli existed in the water of the well for a brief period, and at the proper time to transmit the infection which may have been carried in the milk supply to the Wilkins residence in Adel, such typhoid bacilli must have been present in the surface contamination of the barnyard and must have found their way into the water of the well as the result of rainfall picking up surface impurities and causing the same to seep or percolate into the soil, either about the well, or on the low lands before described, thus finding their way into the water supply of the well.

The meaning of such a condition would be that the water of the well used in washing the milk vessels, or in rinsing the same, without such water being sterilized by boiling, would convey to such milk vessels typhoid bacilli contained in the water, and thus provide the opportunity for the culture of such typhoid bacilli in the milk, and cause the milk infection.

This condition of affairs represents one of the possibilities whereby the infection could be transmitted.

Second. In the preceding discussion showing the possibility of typhoid infection in the well it will be understood that the presence of typhoid bacilli in the surface contamination of the barnyard would need to be accounted for. The second possibility takes into account conditions that would furnish such typhoid infection.

An examination of the map here appended shows the North Raccoon River traversing a peculiarly tortuous route. The map also shows the

location of the mill slough. For many years the mill slough has been furnishing a water power, which was accomplished by placing a dam in the Raccoon River just below the head of the mill slough, which diverts the regular flow of water in the river through the mill slough, across which, farther down, a dam is placed where the water power is furnished.

It is assumed that the locations given upon this map are not strictly accurate, but the map was traced from the Dallas County Atlas, and is understood to show conditions accurately.

It appears that this mill slough has been excellent fishing ground for many years. The water of the slough is practically constant in depth, varying but slightly in flood times. It is also true that the water of the slough is of a goodly depth throughout the length of the slough, and in many places is very deep. Such conditions have furnished excellent opportunities for fishing, which opportunities have been improved by fisherman from considerable distances and from many localities.

It appears that that portion of the mill slough adjoining the Wilkins farm has been one of the excellent fishing localities. It appears also that during the fishing seasons of the year many people have visited this locality. The neighborly and friendly spirit exhibited by the Wilkins people to any and all visitors desiring to avail themselves of the excellent opportunties for fishing at this locality has resulted in the very liberal use of that portion of the Wilkins farm adjacent to the mill slough. It is also stated that the fishermen visiting this locality frequently come prepared to stay several days at a time, and on such occasions would camp in this locality on the Wilkins farm, adjacent to the mill slough. There is little opportunity to know how many such fishermen would visit this locality during the course of the fishing season, except that the number is considerable and might in a single year be several hundred, but it is known that these fishermen come from considerable distances and from many different localities in the state.

The entrance to this fishing ground is through the barnyard and past the farm buildings on the Wilkins farm, and the low land, or bottom, at the foot of the hill on which the farm buildings are situated and adjacent to the mill slough, which ground is limited in area, which is occupied by the fishermen during such fishing trips, and is also the pasture land for the milch cows belonging to Mr. Wilkins.

It may be stated that the arrangement of the farm buildings at the Wilkins farm, and the manner in which these buildings are kept, as well as the barnyards, and other conditions cannot be criticised as being unsanitary when compared with such buildings or barnyards as the same are found upon Iowa farms. It is even true that the conditions found on the Wilkins farm, including the residence and its appointments, must be considered far above the average conditions to be found throughout Iowa. However, it is true, as would be true in a farm so equipped, that it would be quite possible under the conditions before described, for typhoid infection to be transmitted to the milk by contact methods.

Taking into account the rather limited area of pasture land where the fishing parties would camp, the imperfect disposal of bodily wastes in all such camp life, the frequenting of the barns and barnyards by members of such fishing parties, the amount of infection made possible in the surface wastes constantly accumulating under such conditions, and the fact that the milch cows could readily receive such infection upon their bodies by contact, which infection could find its way into the milk vessels at time of milking, we have established the possibility for such infection. Further than this a study of the mill slough, its use as a fishing ground, and its location whereby it quickly receives the surface wash of the hills in times of freshets, will lead the investigator to conclude that the mill slough must be a typhoid stream during such seasons of the year as will allow typhoid bacilli to exist. This being true, it would even be possible that milch cows entering the edge of the mill slough stream, as would undoubtedly be the case at times, could receive upon their bodies the typhoid bacilli from the water, and which later would find entry into the milk as above described. It is evident that these conditions furnish the opportunity for the transmission of typhoid infection. It is significant also that the typhoid occurring in years past, so far as the history of the same was obtainable, has occurred in localities that bear some definite relation to this mill slough territory.

If one were seeking the probable locations of typhoid fever in Adel he would not seek the elevated localities along the hills bordering upon this mill stream, but would rather seek the lower parts of the town where conditions are similar to conditions in most towns where such epidemics occur. But the fact remains that this elevated territory, where the investigator would expect the homes to be free from typhoid, is the locality where the typhoid has occurred in times past, and in order to account for such peculiar conditions, just such conditions as have existed along the mill slough due to the use of this territory as a fishing ground and as a temporary lodging place for transients of the character before described, furnish the necessary explanation. The existence of typhoid in this elevated territory in times past and the occurrence of this recent severe epidemic are not explainable in the ordinary way, but when it is understood that the mill slough furnishes the opportunity for indiscriminate mingling of transient people from far and near, thereby bringing to this locality whatever infection may be transmitted or perpetuated by the unsanitary practices and conditions of such transient habitation, the situation which has been difficult of solution is probably explained.

The conclusion is reached, therefore, that the typhoid infection which found its way into the milk supply, and which was possibly responsible for the epidemic, was carried to the Wilkins farm by the visitors who made use of the fishing grounds, and the further conclusion is reached that such typhoid infection was possibly conveyed to the milk from the

bodies or udders of the cows, having been received by them by contact with surface impurities containing such typhoid infection.

In reaching this conclusion we do not wish to exclude the possibility of the existence of the typhoid infection in the farm well, and in the absence of the second possibility above described we would be warranted in concluding that there was a reasonable probability of such infection existing in the water of the well. However, the conditions enumerated above in the consideration of the second possibility seem to far outweigh the conditions incident to the possible well infection, and for that reason we believe that the conclusion reached regarding the conditions establishing the second possibility is the correct conclusion.

We may therefore summarize and restate the facts in the following conclusion:

After full consideration of the two possible sources of the typhoid infection at the Wilkins farm, as above described, it is the unanimous opinion of Dr. Henry Albert, Dr. C. L. Bartlett, and the writer, the Sanitary Engineer of the State Board of Health, that the infection existed in the milk or cream used in the preparation of the supper held at the residence of Mr. T. J. Wilkins in Adel, November 5, 1914; that the infection possibly entered the milk at the time of milking at the Wilkins farm, and that such infection was carried upon the bodies or udders of the milch cows after having been received by contact with surface impurities containing such infection as the result of unsanitary practices and the careless habits of the transients or visitors who frequented the Wilkins farm and made use of the mill slough for fishing purposes.

RECOMMENDATIONS.

In view of the above findings it is recommended that the public use of the Wilkins farm, or any other locality adjacent to the mill slough, where such use by transient fishermen would produce like menacing conditions, be prohibited.

It is further recommended that all precautions be taken to prevent the transmission of typhoid infection by the general and indiscriminate use of the mill slough and the back water of Butler Creek, which empties into the mill slough, by domestic animals or individuals, for the reason that at certain periods of the year the water of the mill slough must be considered to be infected by typhoid bacilli, and the contact of man or beast with the water of the mill slough will furnish the means of transmitting the typhoid bacilli which the water contains, and thereby give rise to typhoid infection either in isolated cases, or in epidemic form.

It is also recommended that the local Boards of Health, through whose jurisdiction the mill slough runs, shall take the necessary precautions by resolution, or otherwise, to carry into effect these recommendations.

It is likewise recommended that the precautions and recommendations set forth in the complete sanitary survey of Adel, which is here appended, be carried out by the officials of Adel in good faith and at the earliest possible date.

In conclusion it is fitting to acknowledge the cooperation and valuable assistance of the municipal officials, the physicians and the Health Officer of Adel.

All those who were concerned in the preparation and serving of the supper where the typhoid infection occurred are likewise commended for their ready compliance to the requests of the investigators and for their desire to assist in every way possible in determining the source of the infection.

And finally it may be truthfully said that this untimely epidemic cannot be, and should not be, made a matter of blame to be laid at the door of any of the parties concerned in giving the supper held at the home of Mr. and Mrs. T. J. Wilkins, in Adel, where the infection occurred. With this view of the matter the people of Adel may lighten the burdens of a number of excellent people who have carried a heavy burden of mental distress because they have feared that in some way they may have been, or would be held, responsible for the epidemic. Such responsibility is not so fixed by those who have made this investigation, and it is hoped that the people of Adel will not seem to incriminate anyone because of the unfortunate results endured, but will seek to promote such measures as may be thought necessary to prevent like epidemics in the future.

DR. HENRY ALBERT,
Director Bacteriological Laboratory Iowa State Board of Health.
DR. C. L. BARTLETT,
Assistant Bacteriologist.
PROF. LAFAYETTE HIGGINS,
Civil and Sanitary Engineer Iowa State Board of Health.
July 19, 1915.

SANITARY SURVEY OF ADEL

The investigation of the typhoid epidemic, which was begun soon after the appearance of the epidemic, did not suggest that the water supply of Adel nor any unsanitary conditions existing at the time of the epidemic, were responsible for the epidemic.

The sanitary survey was made for the purpose of placing before the citizens of Adel, and placing before the municipal authorities, the exact condition of Adel, and in order that proper precautionary measures might be taken to better the sanitary condition and to prevent the occurrence of typhoid fever, or epidemics of the same, in the future. It was deemed advisable to take such precautionary measures for the reason that the lack of such precautions in other cities and towns of Iowa has resulted in epidemic conditions, although the town of Adel has been, in years past, practically free from typhoid fever to any extent that would cause alarm.

WATER SUPPLY.

The investigation made during the progress of this survey indicate that the public water supply of Adel has been safe and sanitary. The water supply is taken from a well nearly 300 feet deep, and is located in a favorable location where surface contamination could hardly reach the water supply.

At the time of writing this report the town has about completed sinking a new well near the location of the old well, this well being over

300 feet in depth. It is expected that the water supply for Adel will be entirely satisfactory in the future, except from the one fact that the water is, by reason of the depth of the well, rather heavily mineral.

SEWER SYSTEMS.

Sewers have been installed in Adel, but not throughout the entire town. Apparently these have been installed at different times and under different conditions of urgency. According to the information received during this survey there are four outlets discharging the sewage into the Raccoon River and the mill slough. These sewers were installed prior to the legislative enactment of the 33d General Assembly, which enactment is understood to require sewage treatment plants. It therefore appears that Adel is one of nearly one hundred cities and towns in Iowa that, for the time being, are in violation of the statute. It is generally understood, however, that such cities and towns will in the near future install sewage treatment plants to purify the sewage before discharging the same into streams. Apparently it would not be difficult at Adel to install a common intercepting sewer that would pick up all of the main sewers and conduct the sewage to a suitable location nearby where a sewage treatment plant could be successfully installed and operated. It did not appear that the disposal of the sewage of Adel in the manner indicated was responsible in any way for the recent epidemic of typhoid fever, but it would be true that the discharge of unpurified sewage into the Raccoon River and mill slough, located as they are on the edge of the town, constitutes a menace, for the reason that such sewage discharge causes the Raccoon River and mill slough receiving such sewage to become, at certain seasons of the year, typhoid streams, and as such they could be the origin of typhoid infection. To some extent the water of these streams might be used as a water supply, in which the danger of infecton would be great, but it would also be possible to transmit typhoid infection from the water of these streams by contact methods.

The survey developed the fact that a large number of private wells are still in use in Adel. It was thought best to make field tests of all of the wells so used. Mr. Gharrett Jordan, Assistant Chemist to the State Board of Health, was detailed to make an examination of the water of these wells. His report shows that 271 wells were examined.

The field tests of these wells reveal the usual conditions to be found in any city or town in Iowa of the age of the town of Adel. It should not be necessary to discuss at length the pollution of the wells at Adel. Such pollution is inevitable under the conditions of ordinary community life, and no town or city is safe from epidemics of water-borne diseases under such conditions.

As indicated upon the report blanks three field tests were made of the water of each well; a test for chloride, a test for nitrites, and a permanganate pollution test. In addition to these three tests, physical tests were made on many of the samples.

The particular significance of the chloride test is to determine the pollution of the water of the wells from what are commonly spoken of as sewage sources. Any considerable increase of the chlorine content indicates pollution from sewage sources. Such pollution may be be of the character denominated "past" polution, wherein the pollution of the well has not been directly from the entrance of sewage or night soil, but from the results of soil purification of such sewage or night soil.

If, however, in connection with the chlorine test it is found that the nitrite showing is considerable, or high, then active pollution is indicated, and the conclusion reached in such a case is that the well is dangerously polluted.

The third test, or "pollution indicated by permanganate test", enables the investigator to judge the amount of pollution affecting the water at the time of the investigation.

The physical and microscopical tests indicate the presence of algae, microscopical life, or the conditions incident thereto. While it would be true that the water of a surface well, or shallow well, would seldom, if ever, be free from some form of algae or microscopic life, yet a satisactory or safe water should not contain algae or microscopic life to a high degree, and at favorable seasons of the year such content should be little enough to be considered negligible.

At the time these field investigations were made the greater part of the surface impurities were locked in or upon the frozen ground, and the nitrite showing throughout is much less than would be shown at any other season of the year. The same explanation could be offered for the amount of pollution shown by the permanganate test. While some of the wells show a heavy pollution, the majority show medium or small pollution. In addition it may be said that driven wells do not show the pollution contained nearly so high as dug wells, and it will be observed that a very large number of the wells examined are driven wells.

Therefore, it will be best to consider the chlorine content of these wells in determining the amount of pollution, since the chlorine content is least affected by the prohibitive conditions above mentioned. For convenience the following classification of these wells according to chlorine content is given, and in considering this classification it is well to remember that the normal chlorine content, or the chlorine content of a well in this locality before the town was built, would probably not have exceeded three parts per million. It will be noted that the State Standard is given as 3.50 parts per million, which standard represents the judgment of a large number of chemists as to what might be taken as the average normal content of unpolluted shallow well water in Iowa.

Chlorine Content. Parts per Million.	Number of Wells.
Up to 10	51
11 to 20	49
21 to 30	64
31 to 40	53
41 to 50	31
51 to 60	10
61 to 70	7
71 to 80	4
81 to 90	2

Above 91 parts per million of chlorine, there were ten wells which showed a chlorine content running from ninety-five parts per million to one hundred and ninety parts per million of chlorine.

If one were expected to say that any of the wells examined would be entirely safe to use, he would be compelled to limit his judgment to the first group of wells, or those showing chlorides less than 11 parts per million. It is possible and probable that a considerable number of the wells would not be considered dangerous because the pollution shown by such wells would be considered "past" pollution. However, when one contemplates the chlorine content of the majority of the wells, especially those whose chlorine content is 50 parts, or more, per million, and finds that many of these wells exhibit also active pollution, the conclusion would be reached that a majority of the wells tested should be considered unsafe to use and a considerable number ought to be regarded as dangerous. It is probably true that not more than one-fourth of these wells should be regarded as safe to use. That typhoid fever has not appeared more frequently in Adel is due to the fact that the specific infection has not been disseminated in a way to reach the water supply of the wells. However, the pollution of the wells is such as to indicate that other water-borne diseases, such as dysentery, may exist and be perpetuated through the pollution of the wells such as is indicated by these field tests. In any event, the use of water subject to constant pollution is productive of minor intestinal troubles, which should be avoided.

It is rather singular that so many of the residents should be using well water after having had the opportunity for many years of making use of the public water supply. Possibly the lack of information on the part of the ordinary resident as to the real nature of shallow well water, where the same is subject to the infection incident to community life, together with the fact that many people object to the use of a deep well water on account of the mineral content, is responsible for the extensive and continued use of shalow wells. Taking into account recent events it would seem that the majority, if not all, of the residents of Adel would desire to make use of the public water supply and discontinue the use of private wells.

CESSPOOLS.

The survey included the investigation of the installation of cesspools. Mr. Jordan reports twelve cesspools in actual use, ten of which dispose of wash water and waste water only, and two of which dispose of the sewage from toilets. This showing does not indicate that a great amount of the pollution of the wells had been caused by cesspools. However, it would appear that with the extension of the existing sewers it would only be a short time until the proper connections would be made to the sewer, and all cesspools discontinued.

OUTSIDE TOILETS.

There are many outside toilets or privies still in use in Adel, due to the fact that residents having access to the sewer have not availed themselves of the use of the sewer, preferring to use their shallow wells as a source of domestic water supply, and for which reason such residents have not yet installed the public water supply. There is little inducement to modern sanitary installations in the home until the public water supply is installed, so that the necessary water pressure may be supplied.

The condition of the outside toilets is fair, but it must be said that there are few, if any, towns in Iowa that have required the proper construction and care of outside toilets to make them sanitary and fly proof. There is little or no defense to make of the continuance of the use of the outside toilet in Adel longer than the period of time necessary to make the proper connections with the public water supply and public sewer and to extend the sewer and water systems to furnish such accommodation.

All of the advice and encouragement should be directed toward the furnishing of proper sewer and water facilities and to the consequent abatement of the outdoor toilet.

GARBAGE DISPOSAL.

The recent investigation for the purposes of this survey indicated that the town of Adel should be regarded considerably in advance of the average Iowa town in the disposal of its garbage. However, some care needs to be taken to prevent the accumulation of stable wastes, and also to prevent the accumulation of kitchen wastes where the same are deposited in or near the streets and alleys or upon the premises where such wastes are produced.

The question of highest importance in garbage disposal in community life is to prevent disease transmission through the medium of flies. Certain accumulated wastes, such as stable wastes, furnish a breeding place for flies, and other wastes furnish a feeding place for flies from which disease germs may be carried by the flies into the homes and into places where food is prepared and eaten, or into stores, bakeries, etc., from which is distributed to the consumers.

RECOMMENDATIONS.

The following recommendations are made:

First. That the public water supply be made available to all the residents of Adel.

Second. That steps be taken to extend the sewer system, or parts thereof, where it is possible to so extend the sewer system, to make such extensions available for the use of the residents.

Third. That at the earliest date at which the project may be financed there shall be constructed an intercepting sewer, which shall receive all of the present outlet sewers and shall be continued and built to a suitable location at which a sewage treatment plant will be constructed for the purpose of purifying the sewage before the same is discharged into the Raccoon River.

Fourth. That the installation of the public water supply and other sanitary installations be made in the homes and required by ordinance within a reasonable time after such public water supply and sewer facilities are made available.

Fifth. That the outside toilets shall be abated as rapidly as other facilities are made available, and that where it is necessary to continue the use of outside toilets the same shall be made sanitary and fly proof and so maintained throughout their use.

Sixth. That strict inspection of the streets and alleys of the town, and the premises attached to business houses or residences, in so far as the condition of the same may affect the public health, shall be made by the Health Officer, or other person appointed to such service by the Local Board of Health, at least twice a year, during the spring time and in the early fall, and at such other times as may be found necessary, and that the necessary ordinances or rules be passed to provide for the abatement of unsanitary conditions revealed by such inspection.

These recommendations are applicable to the average Iowa town and the conditions found at Adel warrant such recommendations. It is with a desire to render the fullest assistance to the people of Adel that these recommendations are made, and as previously stated in this report, the survey was made and the recommendations given for the purpose of advising the local board of health of Adel of the precautions that should be taken to protect the health and lives of the people.

LAFAYETTE HIGGINS,
Civil and Sanitary Engineer,
Iowa State Board of Health.

LH B
July 19, 1915.

SANITARY SURVEY OF MAPLE, JUNE, 1915

This sanitary survey was made primarily for the purpose of determining whether the requirements of the State Board of Health made following the sanitary survey of Maple during July, 1913, had been carried out in good faith. It was also the purpose of the survey to determine whether or not additional sanitary regulations would be required in the mining camp.

The water of all the wells in use, twenty in number, was field tested. The analyses show the water of nineteen of the wells to be satisfactory, while one of the wells which is a dug well used as a storage well into which the water from a well 314 feet deep is pumped showed heavy contamination. Since the water of the deep well is safe and sanitary, the condition of the storage well was a matter of neglect which could be easily corrected, and instructions were given for the cleaning of the well to place the same in safe and sanitary condition.

The water supply of the shallow wells was scant, as most of the wells are exhausted during the warm months of summer, thereby compelling the use of the deep well and some shallow farm wells in the immediate vicinity.

It is impossible in this locality to obtain a satisfactory deep well supply.

The mining camp was found to be well operated, and was considered satisfactory at the time of the survey.

SANITARY SURVEY OF UNION

Union is a town of 600 population. At the time of the sanitary survey, it had a public water supply, but no sanitary sewer system. The residents of Union desiring to install modern conveniences in their homes resorted to the use of private septic tanks and cesspools as a means of sewage disposal. At the request of the mayor, the sanitary engineer of the State Board of Health visited Union during March, 1915, and made a brief sanitary survey of the town. Following this visit, the officials and citizens of Union filed a petition with the State Board of Health requesting that a complete sanitary survey be made.

During the month of June, 1915, Mr. Gharrett Jordan, Assistant Chemist of the State Board of Health, was sent to Union with instructions to field test the water of all wells used as a source of public or domestic water supply, and to investigate the use of septic tanks and cesspools used as a means of sewage disposal, and also to investigate any unsanitary conditions found in the town. Mr. Jordan examined the water of 116 private wells, and water of the wells furnishing the public water supply. He also located 30 residential sewage treatment plants. Of the wells examined, 35 were found to be good, 40 were found to be suspicious, and 42 were found to be bad. A complete report of the sanitary survey was made to the town council of Union, which report contains the following conclusions and recommendations:

CONCLUSIONS.

First. That the public water supply is menaced by the extensive installations of residential sewage treatment plants, and is liable at any time to receive infection therefrom.

Second. That the continued use of private wells which show excessive contamination and wells classified as *suspicious* constitutes a menace to the people using such wells.

Third. That the outside toilet system contributes to the contamination of the private wells in use.

Fourth. That the installation of cesspools contributes in many cases to the contamination of nearby wells.

Fifth. That the installation of residential treatment plants, if continued, will indefinitely postpone the installation of a sanitary sewer system.

Sixth. That the installation of a sanitary sewer system equipped with sewage treatment plant is necessary in order to protect life and health of the citizens of Union.

RECOMMENDATIONS.

First. That the public water supply be improved and extended to supply all of the citizens of the town at the earliest possible time.

Second. That the necessary steps be immediately taken to obtain plans and specifications for a complete sanitary sewer system. That following such survey, and preparation of plans and specifications, the proper resolution of necessity be passed and the legal steps taken pro-

viding for the installation of the sanitary sewer system and sewage treatment plant, which installations should be made not later than 1916.

Third. That the installation of residential sewage treatment plants in the future should be forbidden and prevented.

Fourth. That all outside toilets remaining in use should be made sanitary and fly proof. That the vaults of outside toilets should be emptied and cleaned twice a year, in the spring and fall, and such other times as may be found necessary. That such vaults should be thoroughly disinfected when cleaned, and at any time when considered necessary by the health officer. That the contents of vaults should be removed to some remote and satisfactory location and disposed of in accordance with the statutes governing the disposal of night soil, such disposal to require burial or chemical treatment of the contents of the vaults.

Fifth. That a better method of collection and disposal of garbage, offal from barns, and other refuse be determined upon and enforced.

Following the completion of the sanitary survey, and the report of the same, the mayor and town council of Union, Iowa, were directed to take the necessary steps for the installation of a sanitary sewer system with sewage treatment plant.

The directions of the state board of health were carried out and the sanitary sewer system with sewage treatment plant was completed during the year 1916.

SANITARY SURVEY OF STRAWBERRY POINT, CLAYTON COUNTY, AUGUST, 1915

Strawberry Point is a town of 1,158. About eight years prior to the making of this survey, the town officials employed M. Tschirgi & Sons, Engineers, to make a survey and prepare plans and specifications for sewer systems and sewage treatment plants. The installations were not made, and the unsanitary conditions caused by the discharge of raw sewage and sewage effluent from residential sewage treatment plants into the street gutters became so serious a menace that a petition by residents of Strawberry Point was filed with the State Board of Health in May 1915, asking that the State Board of Health investigate the unsanitary condition and order the installation of a sanitary sewer system. Upon receiving the petition the sanitary engineer of the State Board visited Strawberry Point. The unsanitary conditions were found to exist as set forth in the petition, and the conditions were such as to warrant the State Board of Health in ordering the installation of a sanitary sewer system. Such order was made to the town council of Strawberry Point, and the necessary steps were taken to install the sanitary sewer system with sewage treatment plant. The installation of a sanitary sewer and sewage treatment plant was completed during the year 1916.

OFFICE WORK OF THE ENGINEER.

APPROVAL OF PLANS AND SPECIFICATIONS

Humeston, Wayne County, population 1,034. Plans and specifications for water works prepared by Hall and Adams, Engineers, Centerville, Iowa. Water supply is furnished by impounding reservoirs. Plans are accompanied by topographical map showing impounding reservoirs and watershed. The system consists of an elevated steel tank, capacity 60,000 gallons, pumping station and the customary distributing pipe system. The plans contemplate the addition of a water filtration plant in the near future. Plans and specifications were approved July 21, 1914.

Edenville (Rhodes), Marshall County, population 451. Plans and specifications for a system of water works prepared by C. W. Roland Company, Engineers, Des Moines, Iowa. Plans show water supply from a 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 were approved July 22, 1914.

Holstein, Ida County, population 1,137. Plans and specifications for sewage treatment plant improvements prepared by M. I. Evinger, Consulting Engineer, Ames, Iowa. The plans and specifications provide for intermittent sand filters to replace existing sand filters. The plans also include provisions for diverting excess ground water. Plans were approved July 23, 1914.

Knoxville, Marion County, population 3,541. Plans and specifications for water works, prepared by Dabney H. Maury, Consulting Engineer, Chicago, for David G. Fisher and Company Public Utility Engineers, Davenport, Iowa. Water supply is located on sand bar of Des Moines river about seven miles from city of Knoxville, Iowa. Plans include collecting wells, pumping station located at the river, reservoir and pumping station located in city. Plans were approved August 4, 1914.

Gilbert, Story County, population 252. Plans and specifications for system of water works prepared by M. I. Evinger. Plans show water supply from deep well located within the town. The system consists of an elevated steel tank, capacity 30,000 gallons, pumping station, and the customary distributing pipe system. Plans and specifications approved August 6, 1914.

Note—Plans and specifications rejected by the town council and contract made for air pressure system. Air pressure system has not been approved by the State Board of Health.

Keota, Keokuk County, population 1,071. Plans and specifications for sewer system and sewage treatment plant prepared by Charles P. Chase, Hydraulic & Sanitary Engineer, Clinton, Iowa. Plans show the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. Plans and specifications were approved August 13th, 1914.

Grand Mound, Clinton County, population 481. Plans and specifications for water works system prepared by Charles P. Chase. Plans include elevated steel tank, capacity 50,000 gallons, to replace existing wooden tank, a new pumping station, and an addition to the distributing pipe system. The water supply comes from a well about 90 feet deep located at the old pumping station in the heart of the town. The engineer of the State Board of Health visited this location and required the proper protection of the well to prevent contamination of the water supply. Plans and specifications were approved August 20, 1914.

Algona, Kossuth County, population 3,593. Plans for extension of existing sewer systems, prepared by Theodore S. Delay, City Engineer, Creston, Iowa. Plans were approved August 25, 1914.

Stanton, Montgomery County, population 705. Plans and specifications for system of water works prepared by Theodore S. DeLay. System consists of an elevated steel tank, pumping station and customary distributing pipe system. The contemplated water supply comes from a 60 foot deep well, passing through impervious soil into water bearing gravel stratum. Plans and specifications were approved September 21, 1914.

Creston, Union County, population 7,572. Plans and specifications for extensions to existing sewer system. Plans contemplate the addition of two sewage treatment plants in the near future. Plans were approved September 21, 1914.

Onawa, Monona County, population 2,210. Plans and specifications for sewer system and sewage treatment plant prepared by Bruce and Standeven, Consulting Engineers, Omaha, Nebraska. The plans show the entire city included in one sewer district. The sewage treatment plant consists of an Imhoff tank with intermittent sand filters. The specifications require that the sewage be pumped from a receiving tank into the septic tank. Plans and specifications were approved September 26, 1914.

Denison, Crawford County, population 3,455. Plans and specifications for extension of existing sewer system prepared by Frank Woolston, City Engineer, Denison, Iowa. Plans and specifications were approved September 26, 1914.

Tripoli, Bremer County, population 854. Plans and specifications for sewer system and sewage treatment plant prepared by M. Tschirgi and Sons, Engineers and Contractors, Cedar Rapids, Iowa. Plans show the entire town included in one sewer district. The sewage treatment plant consists of septic tank and intermittent sand filters. Plans and specifications were approved September 29, 1914.

Grinnell, Poweshiek County, population 5,061. Plans and specifications for sewer systems and sewage treatment plant prepared by Charles P. Chase. The plans include the remodelling of the present sewer system and combine the same with the new sewer system, making the entire city into one sewer district. The plans show that the sewage will be conducted and a treatment plant situated about a mile and a quarter southwest of the city of Grinnell. The sewage treatment plant consists of two Imhoff tanks with intermittent sand filters. Plans and specifications were approved October 5, 1914.

Audubon, Audubon County, population 2,084. Plans and specifications for sewer systems and sewage treatment plants prepared by P. A. Edquist, Civil Engineer, Omaha. Plans show that the city is included in two sewer districts requiring two sewer systems. These systems are provided with sewage treatment plants consisting of septic tanks and intermittent sand filters. Plans and specifications were approved October 5, 1914.

Sioux Rapids, Buena Vista County, population 1,023. Plans and specifications for partial water works equipment prepared by M. I. Evinger Plans and specifications provide for the construction of an elevated steel tank and tower; capacity of tank 75,000 gallons. Plans were approved October 15, 1914.

Hartley, O'Brien County, population 1,115. Plans and specifications for sewer system and sewage treatment plant prepared by Bruce and Standeven. The plans show the entire city included in one sewer district. The sewage treatment plant consists of an Imhoff tank with intermittent sand filters. Plans and specifications were approved October 28, 1914.

Yale, Guthrie County, population 305. Plans and specifications for system of water works, prepared by the Des Moines Bridge and Iron Company, Des Moines, Iowa. Plans provide for elevated steel tank, capacity 35,000 gallons, pumping station and the customary distributing pipe system. The water supply comes from a well about 90 feet deep, situated in the heart of the town. The location has been visited by the engineer of the State Board of Health and instructions given to the town council regarding the proper protection of the well to prevent contamination. Plans and specifications approved December 18, 1914.

Osceola, Clarke County, population 2,714. Preliminary report and plans and specifications for system of waterworks prepared by Charles P. Chase. Plans include new pumping station and storage reservoir. Plans and specifications were approved February 15th, 1915.

Northwood, Worth County, population 1,525. Plans and specifications for water works tank prepared by Charles P. Chase. Plans and specifications provide for the construction of an elevated steel tank, capacity 50,000 gallons, and for the extension and improvement of existing steel tower. Plans were approved February 15, 1915.

Woodbine, Harrison County, population 1,613. Plans and specifications for sewer system and sewage treatment plant prepared by Bruce and Standeven. Plans show the entire town included in one sewer district. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. Plans and specifications were approved February 20, 1915.

Decorah, Winneshiek County, population 4,021. Preliminary report of proposed sewer system and sewage treatment plant prepared by the Iowa Engineering Company, Consulting Engineers, and A. R. Coffeen, City Engineer, Decorah, Iowa. Preliminary report is accompanied by a topographical map showing the entire city included in one sewer district. The sewage treatment plant consists of a septic tank with intermittent sand filters. Preliminary report was approved March 1, 1915.

Dixon, Scott County, population 219. Plans and specifications for system of water works prepared by the Des Moines Bridge & Iron Company. Plans include elevated steel tank, capacity 30,000 gallons, a pumping station and the customary distributing pipe system. Plans and specifications were approved March 2, 1915.

Garner, Hancock County, population 1,226. Preliminary report on proposed sewer system and sewage treatment plant prepared by Charles P. Chase. The preliminary report is accompanied by a topographical map showing the town of Garner included in one sewer district. The sewage treatment plant consists of a septic tank with intermittent sand filters. The location requires that the sewage be pumped from a receiving chamber into the disposal plant. Preliminary report was approved March 6, 1915.

What Cheer, Keokuk County, population 1,805. Plans and specifications for sewer system prepared by Bruce and Standeven. The plans show that the entire town is included in one sewer system. The sewage treatment plant consists of a septic tank with intermittent sand filters. Plans and specifications were approved March 10, 1915.

Goldfield, Wright County, population 748. Plans and specifications for water works prepared by C. W. Roland. Plans to include elevated steel tank, capacity 40,000 gallons and the customary distributing pipe system. The supply is to be taken for the present from a town well of ordinary depth, which will require protection to safeguard the water. Plans and specifications were approved March 12, 1915.

Postville, Allamakee County, population 1,003. Plans and specifications for sewer system prepared by W. L. Richards and revised by the Aetna Engineering Bureau, Civil and Sanitary Engineers, Chicago, Illinois. The plans show the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. Plans and specifications were approved March 18, 1915.

Parkersburg, Butler County, population 1,027. Plans and specifications for improvements in public water supply system, prepared by C. W. Roland. Plans include new elevated steel tank, capacity 100,000 gallons, and extensions of existing distributing pipe system. Plans and specifications were approved March 22, 1915.

Decorah, Winneshiek County, population 4,021. Plans and specifications for sewer system and sewage treatment plant prepared by A. R. Coffeen, City Engineer, Decorah, and the Iowa Engineering Company, Consulting Engineers, Clinton, Iowa. Plans and specificatious show the entire city included in one sewer district except the north low lying portion of the city, the outlet of which is too low to enter the disposal plant without pumping. A pumping station is to be supplied for this part of the sewer system. The sewage treatment plant consists of a septic tank and intermittent sand filters. The effluent from the treatment plant will empty directly into the Upper Iowa river. Plans and specifications were approved March 25, 1915.

Maynard, Fayette County, population 426. Plans and specifications for system of water works prepared by Des Moines Bridge & Iron Company. Plans provide for an elevated steel tank of 40,000 gallons capacity. Also for deep well pumping equipment and pumping station. Plans and specifications were approved March 29, 1915.

Crawfordsville, Washington County, population 323. Plans and specifications for system of water works, prepared by the Des Moines Bridge & Iron Company. Plans provide for elevated steel tank, capacity 30,000 gallons and the customary distributing pipe system. Source of water supply not given. Plans and specifications were approved March 29, 1915.

Lake Mills, Winnebago County, population 1,480. Plans and specifications for sewer system and sewage treatment plant prepared by M. Tschirgi and Son. Plans show the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. Plans and specifications were approved conditionally April 5, 1915.

State Center, Marshall County, population 1,037. Plans and specifications for sewer system and sewage treatment plant prepared by Sam Steigerwalt, City Engineer, Nevada, Iowa. Plans show the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. In this case the municipal authorities had already taken bids on the sewer system before the plans were sent to the State Board of Health for approval. The approval placed upon these plans and specifications contains several recommendations that should be provided for in the contract and followed out. Plans and specifications were given conditional approval April 17, 1915.

Lake View, Sac County, population 814. Plans and specifications for sewer system and sewage treatment plant prepared by Bruce, Standeven and Boynton, Engineers, Omaha, Nebraska. Plans show the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. Plans and specifications were approved April 22, 1915.

Sanborn, O'Brien County, population 1,456. Plans and specifications for sewer system and sewage disposal plant prepared by P. A. Edquist. Plans show that the entire town is included in one sewer system. The sewage treatment plant consists of a hydrolytic tank intended to operate partly on the plan of a septic tank and partly as an Imhoff tank. Intermittent sand filtration is provided. Plans and specifications were approved April 23, 1915.

Spillville, Winneshiek County, population 314. Plans and specifications for water works prepared by the Des Moines Bridge & Iron Company. The contemplated installation comprises a 30,000 gallon elevated steel tank, deep well pumping equipment and the customary distributing pipe system. Alternative plans for a reinforced concrete reservoir are provided. Plans and specifications were approved April 29, 1915.

Sanborn, O'Brien County, population 1,456. Plans and specifications for water works system prepared by Harper and Stiles, Consulting Engineers, Kansas City, Mo. Plans provide for an elevated steel tank of 50,000 gallons capacity and deep well pump, pumping station, and the customary distributing pipe system. Plans and specifications were approved May 5, 1915.

Morning Sun, Louisa County, population 904. Plans and specifications for water works system prepared by Harper & Stiles. Plans provide for an elevated steel tank of 50,000 gallons capacity, deep well pump and pumping station and the customary distributing pipe system. Plans and specifications were approved May 5, 1915.

Onslow, Jones County, population 231. Plans and specifications for water works system, prepared by the Iowa Engineering Company. Plans provide for a distributing pipe system, a steel tower, steel tank, 30,000 gallon capacity, a deep well, the necessary pumping machinery, and a pump house. Plans and specifications were approved May 7, 1915.

Jewell, Hamilton County, population 1,074. Plans and specifications for sewer system and sewage treatment plant, prepared by C. H. Currie. Plans provide for including entire town in one sewer district. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. Plans and specifications were approved May 8, 1915.

Orange City, Sioux County, population 1,417. Plans and specifications for water works system, prepared by Des Moines Bridge and Iron Company. The plans provide for the distributing pipe system, steel water tower, steel tank of 60,000 gallons capacity. Plans and specifications were approved May 18, 1915.

Carroll, Carroll County, population 4,031. Plans and specifications for sewage treatment plant improvements, prepared by G. C. Beiter, City Engineer, Carroll, Iowa. The plans provide for the refilling of the present filter beds and the construction of three new filter beds. Plans and specifications were approved May 19, 1915.

La Porte City, Black Hawk County, population 1,541. Plans and specifications for sewer system and sewage treatment plant prepared by M. Tschirgi & Sons. The plans show the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. An automatic sewage ejector is provided for the purpose of discharging the effluent from the filters when the water from the creek stands higher than the elevation of the outlet pipe of the filters. Plans and specifications were approved May 19, 1915.

Spencer, Clay County, population 4,176. Plans and specifications for extension of sewer system at Spencer, Iowa, prepared by G. Y. Skeels, Civil Engineer, Sioux City, Iowa. Plans show extension of thirteen blocks of sewer additional to present sewer system. Plans and specifications were approved May 22, 1915.

Mt. Ayr, Monroe County, population 1,708. Plans and specifications for sewer systems and sewage treatment plants prepared by E. T. Archer & Co., Consulting Engineers, Kansas City, Missouri. Plans show town of Mt. Ayr to be divided into four sewer districts, comprising four sewers and four treatment plants. The sewage treatment plants consist of septic tanks with a type of filter is a combination of sprinkling and contact filter. Plans and specifications were approved May 27, 1915.

Lowden, Cedar County, population 630. Preliminary report on proposed water works system for Lowden, Iowa, by J. G. Thorne, Consulting Engineer, Clinton, Iowa. Preliminary report approved June 2, 1915.

Newton, Jasper County, population 5,165. Plans and specifications for outlet sewer and purification plant for the northwest sewer system of Newton, Iowa, prepared by Bruce, Standeven and Boynton. The sewage treatment plant consists of an Imhoff tank, siphon chamber and intermittent sand filters. Plans and specifications were approved June 4, 1915.

McGregor, Clayton County, population 1,244. Plans and specifications for sewer system prepared by M. Tschirgi & Sons. Plans provide for a complete sewer system for the entire town. No sewage treatment plant is provided and the sewage will be discharged into the Mississippi river. Plans and specifications were approved June 6, 1915.

Riverside, Washington County, population 656. Preliminary report on water works system for Riverside, Iowa, prepared by Iowa Engineering Company. Preliminary report approved June 23, 1915.

Lowden, Cedar County, population 630. Plans and specifications for water works system prepared by J. G. Thorne. Plans provide for the construction of distributing pipe system, a steel tower, a steel tank, 40,000 gallons capacity, a deep well, a pumping station, and the necessary pumping machinery. Plans and specifications were approved June 23, 1915.

Chariton, Lucas County, population 5,232. Plans and specifications for the public water supply prepared by M. G. Hall. The plans provide for an impounding reservoir, a water purification plant, a pumping plant and necessary water mains. Plans were approved July 2, 1915.

Riceville, Mitchell County, population 945. Plans and specifications for sewer system and sewage treatment plant prepared by B. B. Hanson, Civil Engineer, Osage, Iowa. The plans show the entire town to be included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. Plans and specifications were approved July 9, 1915.

Riverside, Washington County, population 656. Plans and specifications for water works system prepared by the Iowa Engineering Co. The plans provide for the construction of a deep well, a steel tower, a steel tank, capacity 50,000 gallons, a distributing pipe system, pumping station and the necessary pumping machinery. Plans and specifications were approved July 9, 1915.

Keota, Keokuk County, population 1,071. Plans and specifications for water works improvements prepared by Iowa Engineering Co. The improvement consists of the extension of the present distributing pipe system. The improvement of the water tower, the construction of a new steel tank, 75,000 gallons capacity, the construction of a deep well,

and the pumping station with the necessary pumping machinery. Plans and specifications were approved July 9, 1915.

Denison, Crawford County, population 3,455. Plans and specifications for municipal water works system prepared by J. G. Thorne. The plans call for the construction of additional water mains, the construction of a concrete reservoir, capacity 100,000 gallons, with the provisions for future extension, giving total capacity of 200,000 gallons capacity, a deep well provided with air lift pump, and a pumping station provided with centrifugal pump and motor. Plans and specifications were approved July 9, 1915.

Peterson, Clay County, population 534. Plans and specifications for sewer system and sewage treatment plant prepared by Price and McCormack. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. Plans and specifications were approved July 30, 1915.

Brooklyn, Poweshiek County, population 1,485. Plans and specifications for sewer system with sewage treatment plant prepared by M. Tschirgi & Sons. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. Plans were approved August 4, 1915.

Primghar, O'Brien County, population 923. Plans and specifications for sewer system and sewage treatment plant prepared by Bruce, Standeven and Boynton. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. Plans and specifications were approved August 17, 1915.

Urbana, Benton County, population 393. Plans and specifications for proposed water supply and water distribution system, prepared by Ralph B. Slippy, Civil Engineer, Waterloo, Iowa. Plans comprise customary distribution system and pumping station and pumping equipment, and elevated steel tank of 45,000 gallons capacity. Plans and specifications were approved September 25, 1915.

Strawberry Point, Clayton County, population 1,158. Plans and specifications for sanitary sewer system and sewage treatment plant prepared by M. Tschirgi and Sons. The map of the town shows the town divided into four sewer districts of which District No. 1 includes about three-fourths of the present population. The plans and specifications provide for the sewering of District No. 1. The plans and specifications were approved October 25, 1915.

Elliott, Montgomery County, population 558. Plans and specifications for sewer system and sewage treatment plant prepared by Theo. S. DeLay. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. Plans and specifications were approved September 29, 1915.

Storm Lake, Buena Vista County, population 3,150. The sewage filters for the sewage treatment plant at Storm Lake proved inadequate because of the excessive infiltration. During the season of 1915, the water of infiltration, at times, amounted to about eight times the normal sewage flow, and the filters were called upon to handle a flow equal to four times their capacity. The filters were soon permanently out of commission. At the request of the city council, the sanitary engineer of the State Board of Health examined the sewage filters on August 2d, 1915. The filters were found to be completely fouled and clogged, throughout their entire depth. An examination of the sand disclosed that the sand originally used was unsatisfactory for economical use in sewage filters. The examination determined the necessity of removing the filter sand and replacing the same with satisfactory filter sand. Directions for the reconstruction of the filter beds were given the city council in a report under date of October 2d, 1915. The reconstruction of the filter beds has been completed in accordance with the recommendations made.

Kanawha, Hancock County, population 516. Plans and specifications for water works system prepared by Chas. P. Chase. System comprises customary distribution system, pump pit, and equipment, and elevated steel tank of 45,000 gallons capacity. Plans and specifications were approved October 6, 1915.

Ogden, Boone County, population 1,403. Plans and specifications for sewer system and sewage treatment plant designed by M. I. Evinger, Consulting Engineer, and R. C. Lutze, City Engineer. The sewage treatment plant consists of a septic tank and sprinkling filters. Plans were approved October 16, 1915.

Germania, Kossuth County, population 426. Plans and specifications for water supply system prepared by M. I. Evinger. Plans comprise the customary distribution system, pumping station with pumping equipment, and elevated steel tank of 40,000 gallons capacity. The water supply is furnished by drilled well of supposed depth 125 ft.-175 ft. Plans and specifications were approved October 27, 1915.

Charter Oak, Crawford County, population 799. Plans and specifications for sewer system and sewage treatment plant prepared by Bruce, Standeven and Boynton. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. The plans and specifications were approved November 9, 1915.

Mason City, Cerro Gordo County, population 17,152. Plans and specifications for sewage treatment plant prepared by Prof. Bass. The sewage treatment plants consists of an Imhoff tank and sprinkling filters. Plans and specifications were approved November 17, 1915.

Lisbon, Linn County, population 879. Plans and specifications for sanitary sewer and sewage treatment plant prepared by T. R. Warriner, Civil Engineer, Cedar Rapids, Iowa. The plans show the entire town to be included in one sewer district. The sewage treatment plant consists of a septic tank and siphon chamber and intermittent sand filters. The plans and specifications were approved November 26th, 1915

Sheldon, O'Brien County, population 3,323. Plans and specifications for extension of water supply prepared by K. C. Gaynor, Consulting Engineer, Sioux City, Iowa. Preliminary plans provide for the collection of water by means of pipe collectors laid in sand bar adjoining Floyd River. Preliminary plans were approved December 18, 1915.

Dayton, Webster County, population 806. Plans and specifications for sewer system with sewage treatment plant prepared by K. C. Gaynor. Sewage treatment plant consists of a septic tank with intermittent sand filters. Plans and specifications were approved December 18th, 1915.

Boyden, Sioux County, population 394. Plans and specifications for water supply system prepared by K. C. Gaynor. Plans provide for customary distribution system, the necessary pumping equipment for shallow well supply located remote from town, and for an elevated steel tank, 35,000 gallons capacity. Plans and specifications were approved December 18, 1915.

Lenox, Taylor County, population 1,320. Plans and specifications for sewer system with sewage treatment plant prepared by Theodore S. DeLay. The sewage treatment plant consists of an Imhoff tank and intermittent sand filters. The plans and specifications were approved January 7th, 1916.

Oskaloosa, Mahaska county, population 10,485. Plans and specifications for sewage treatment plant prepared by Black & Veatch, Consulting Engineers, Kansas City, Missouri. The sewage treatment plant consists of an Imhoff tank and contact filters. Plans and specifications were approved January 7th, 1916.

Ackley, Hardin County, population 1,289. Plans and specifications for sewer system and sewage treatment plant prepared by the Hampton Engineering Company, Hampton, Iowa. The sewage treatment plant consists of a septic tank and intermittent sand filters. The pumping plant is required to elevate the sewage from the sewer mains into the sewage disposal plant. Plans and specifications were approved January 24th, 1916.

Northwood, Worth County, population 1,525. Plans and specifications for sanitary sewer system with sewage treatment plant prepared by M. Tschirgi & Sons. The sewage treatment plants consists of a septic tank with intermittent sand filters. Plans and specifications were approved January 28th, 1916.

Creston, Union County, population 7,572. Plans for addition to present sewer system prepared by Theodore S. DeLay. Plans were approved January 29th, 1916.

Bedford, Taylor County, population 1,950. Plans and specifications for outfall sewers and sewage treatment plant prepared by Theodore S. DeLay. The sewage treatment plant consists of an Imhoff tank and intermittent sand filter. Plans and specifications were approved January 29, 1916.

Panora, Guthrie County, population 1,107. Plans and specifications for sanitary sewer system and sewage disposal plant prepared by Bruce & Standeven. Sewage treatment plant consists of septic tank and intermittent sand filters. Plans and specifications were approved January 21st, 1916.

Kenwood Park, Linn County, population 559. Plans and specifications for sanitary sewer system and sewage treatment plant prepared by S.

N. Parsons of Marion, Iowa. The plans contemplate dividing the town into two sewer districts with sewage treatment plant provided for each district. The sewage treatment plants consists of septic tanks, siphon chambers and intermittent sand filters. The plans and specifications were approved March 1st, 1916, the approval to cover all of the proposed installations except the six inch sewer mains which were not approved.

Note: It is understood that the West disposal plant was not installed, and that it is the intention to pump the sewage from the West sewer district into the sewer system of the East sewer district.

Union, Hardin County, population 600. Plans and specifications for sewer system and sewage treatment plant prepared by T. R. Ferry, Engineer. Plans show the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and intermittent sand filters. It was found necessary to pump the filter effluent into the outlet drain. The plans and specifications were approved March 10th, 1916.

Meservey, Cerro Gordo County, population 257. Plans and specifications for sanitary sewer system and sewage treatment plant prepared by Keerl & Stevens, Civil Engineers, Mason City, Iowa. The sewage treatment plant consists of a septic tank with intermittent sand filters. Plans and specifications were approved March 25, 1916.

Newton, Jasper County, population 5,165. Plans and specifications for sewage treatment plant for the disposal of the sewage discharged by the two south outlet sewers prepared by Bruce & Standeven. The sewage treatment plant consists of an Imhoff tank, siphon chamber and intermittent sand filters. Plans and specifications were approved April 8, 1916.

Mt. Vernon, Linn County, population 1,568. The sewage filters of the Mount Vernon sewage treatment plant proved inadequate to properly purify the sewage of Mt. Vernon, and working under the additional load of heavy infiltration went entirely out of commission in the year 1915. At the request of the town council of Mt. Vernon, the sanitary engineer of the State Board of Health inspected the fifters April 13, 1916, and determined upon the necessary improvements, and recommendations for the reconstruction of the filters were embodied in the report of the sanitary engineer made to the town council under date of April 15, 1916. The filters were reconstructed and enlarged as recommended.

Sanborn, O'Brien County, population 1,456. Plans and specifications for sanitary sewer system with sewage treatment plant prepared by P. A. Edquist. The plans show the entire town to be included in one sewer district. The sewage treatment plant consists of a hydrolytic tank, siphon chamber and intermittent sand filters. The plans and specifications were approved April 23, 1916.

Williamsburg, Iowa County, population 1,157. Plans and specifications for sanitary sewers and sewage treatment plant prepared by M. Tschirgi & Sons. The plans show the entire town is included in one sewer system. The sewage treatment plant consists of septic tank, siphon chamber and intermittent sand filters. The plans and specifications were approved May 4, 1916.

Winterset, Madison County, population 2,860. Plans and specifications for improvements on the waterworks system prepared by O. W. Stiles, Consulting Engineer, Kansas City, Mo. The plans provide for new intake wells, a new pumping station and pumping machinery, and the necessary connecting cast iron water mains. The plans and specifications were approved May 8, 1916.

Blairstown, Benton County, population 584. Plans and specifications for system of waterworks prepared by C. W. Roland. The plans and specifications provide for an elevated steel tank, 50,000 gallons capacity, the necessary pumping machinery and the customary distributing pipe system. It is proposed to take the water supply from a deep well located within the town. The plans and specifications were approved May 18, 1916, which approval does not include the approval of the source of water supply, which source must be shown by analysis to be proper and safe and sanitary before the said course of supply can be approved.

New Hampton, Chickasaw County, population 2,664. Plans and specifications for outlet sewers and sewage treatment plant prepared by Geo. D. Dobson, Sanitary Engineer, New Hampton, Iowa. The outlet sewer will receive the sewage from existing sewers now discharging into the old disposal plant which is to be abandoned, and from new sewers and extensions of existing sewers. The sewage treatment plant consists of an Imhoff tank, siphon chamber and intermittent sand filters. The plans and specifications were approved May 24, 1916.

Marion, Linn County, population 4,675. Plans and specifications for new sand filter beds for the sewage treatment plant prepared by H. R. Green, Civil Engineer, Cedar Rapids, Iowa. The proposed filter beds will displace the existing sand filter beds, which are inadequate. The plans and specifications were approved May 27, 1916.

Mapleton, Monona County, population 1,200. Plans and specifications for a sanitary sewer system with sewage treatment plant prepared by Bruce & Standeven. The plans and specifications provide for all of the sewage to be carried to one disposal plant. The greater part of the sewage will be discharged by gravity at the disposal plant. It will be necessary to pump the sewage from a small portion of the town in order that such sewage shall be discharged into the common disposal plant. The plans and specifications were approved May 29, 1916.

Arcadia, Carroll County, population 381. Plans and specifications for waterworks system prepared by L. W. Cox, filed in the office of the State Board of Health June 8, 1916. Mr. Cox took up the matter of the location of the well with the sanitary engineer of the State Board of Health before the same was finally located. The sanitary engineer will visit Arcadia and inspect the system after which the plans and specifications may be approved.

Luverne, Kossuth County, population 501. Plans and specifications for waterworks system prepared by Lawrence W. Cox, Des Moines, Iowa, filed in the office of the State Board of Health, June 8, 1916. This waterworks system has been completed and is in use. The sanitary engineer will visit

the town of Luverne and inspect the waterworks system, after which the plans and specifications may be approved.

Ankeny, Polk County, population 526. Plans and specifications for waterworks system prepared by L. W. Cox. Plans provide for an elevated steel tank, capacity 50,000 gallons, a pumping plant and the customary distributing pipe system. It is proposed to use the water supply of wells several hundred feet in depth. The plans and specifications were approved June 9th, 1916.

Kellogg, Jasper County, population 619. Plans and specifications for extension of water supply system, prepared by Des Moines Bridge & Iron Company. Plans and specifications provide for extension of water mains. Plans and specifications were approved June 19, 1916.

Oxford Junction, Jones County, population 852. Plans and specifications for sanitary sewer system and sewage treatment plant prepared by M. Tschirgi & Sons, Engineers, Cedar Rapids, Iowa. Sewage treatment plant consists of septic tank and intermittent sand filters. Plans and specifications were approved June 20, 1916.

Anthon, Woodbury County, population 758. Plans and specifications for sanitary sewer system and sewage treatment plant prepared by Paul D. Cook, Consulting Engineer, Sioux City, Iowa. Sewage treatment plant consists of a septic tank and intermittent sand filters. Plans and specifications were approved June 26, 1916.

SUMMARY OF APPROVALS.

City or Town	County	Date Approved	Purpose
Ackley	Hardin	January 24, 1916	Sanitary sewer system.
Algona	Kossuth	August 25, 1914	Sewer extensions.
Ankeny	Polk	June 9, 1916	Water works.
Anthon	Woodbury	June 26, 1916	Sanitary sewer system.
Arcadia	Carroll	June 8, 1916	Water works.
Audubon	Audubon	October 5, 1914	Sanitary sewer system.
Bedford	Taylor	January 29, 1916	Sewage treatment plant.
Blairstown	Benton	May 18, 1916	Water works.
Boyden	Sioux	December 18, 1915	Water works.
Brooklyn	Poweshiek	August 4, 1913	Sanitary sewer system.
Carroll	Carroll	May 19, 1915	Sewage filters.
Chariton	Lucas	July 8, 1916	Impounding reservoir.
Charter Oak	Crawford	November 9, 1915	Sanitary sewer system.
Crawfordeville	Washington	March 29, 1913	Water works.
Creston	Union	January 29, 1916	Sewer extensions.
Dayton	Webster	December 18, 1915	Sanitary sewer system.
Decorah	Winneshiek	March 29, 1916	Sanitary sewer system.
Denison	Crawford	September 26, 1914	Sewer extensions.
		July 9, 1913	Water works improvements.
Dixon	Scott	March 2, 1915	Water works.
Edenville (Rhodes)	Marshall	July 22, 1914	Water works.
Elliott	Montgomery	September 29, 1915	Sanitary sewer system.
Garner	Hancock	March 6, 1915	Sanitary sewer system.
Germania	Kossuth	October 27, 1915	Water works.
Gilbert	Story	August 6, 1914	Water works.
Goldfield	Wright	March 12, 1915	Water works.
Grand Mound	Clinton	August 29, 1914	Water works improvements.
Grinnell	Poweshiek	October 5, 1914	Sanitary sewer system.
Hartley	O'Brien	October 28, 1914	Sanitary sewer system.
Holstein	Ida	July 23, 1914	Sewage treatment plant.
Humeston	Wayne	July 21, 1914	Impounding reservoir.
Jewell	Hamilton	May 3, 1913	Sanitary sewer system.
Kanawha	Hancock	October 6, 1915	Water works.

SUMMARY OF APPROVALS—Continued.

City or Town	County	Date Approved	Purpose
Kellogg	Jasper	June 19, 1916	Water works improvements.
Kenwood Park	Linn	March 1, 1916	Sanitary sewer system.
Keota	Keokuk	August 13, 1914	Sanitary sewer system.
		July 9, 1915	Water works improvements.
Knoxville	Marion	August 4, 1914	Water works improvements.
Lake Mills	Winnebago	April 5, 1915	Sanitary sewer system.
Lake View	Sac	April 22, 1915	Sanitary sewer system.
La Porte City	Black Hawk	May 19, 1915	Sanitary sewer system.
Lenox	Taylor	January 7, 1916	Sanitary sewer system.
Lisbon	Linn	November 26, 1915	Sanitary sewer system.
Lowden	Cedar	June 23, 1915	Water works.
Luverne	Kossuth	June 8, 1916	Water works.
Mapleton	Monona	May 29, 1916	Sanitary sewer system.
Marion	Linn	May 27, 1916	Sewage filters.
Mason City	Cerro Gordo	November 17, 1915	Sewage treatment plant.
Maynard	Fayette	March 29, 1915	Water works.
McGregor	Clayton	June 6, 1915	Sanitary sewer system.
Meservey	Cerro Gordo	March 25, 1916	Sanitary sewer system.
Morning Sun	Louisa	May 5, 1915	Water works.
Mount Ayr	Ringgold	May 27, 1915	Sanitary sewer system.
Mt. Vernon	Linn	April 15, 1916	Sewage filters.
New Hampton	Chickasaw	May 24, 1916	Sewage treatment plant.
Newton	Jasper	June 4, 1915	N. W. sewage treatment plant.
		April 8, 1916	S. sewage treatment plant.
Northwood	Worth	February 15, 1915	Water works improvements.
		January 28, 1916	Sanitary sewer system.
Ogden	Boone	October 16, 1915	Sanitary sewer system.
Onawa	Monona	September 26, 1914	Sanitary sewer system.
Onslow	Jones	May 7, 1915	Water works.
Orange City	Sioux	May 18, 1915	Water works.
Osceola	Clarke	February 15, 1915	Water works improvements.
Oskaloosa	Mahaska	January 7, 1916	Sewage treatment plant.
Oxford Junction	Jones	June 20, 1916	Sanitary sewer system.
Panora	Guthrie	January 21, 1916	Water works improvements.
Parkersburg	Butler	March 22, 1915	Sanitary sewer system.
Peterson	Clay	July 30, 1915	Sanitary sewer system.
Postville	Allamakee	March 18, 1915	Sanitary sewer system.
Primghar	O'Brien	August 17, 1915	Sanitary sewer system.
Riceville	Mitchell	July 9, 1915	Sanitary sewer system.
Riverside	Washington	July 9, 1915	Water works improvements.
Sanborn	O'Brien	April 23, 1915	Sanitary sewer system.
		May 5, 1915	Water works.
Sheldon	O'Brien	December 18, 1915	Water works improvement.
Sioux Rapids	Buena Vista	October 15, 1914	Water works improvement.
Spencer	Clay	May 22, 1915	Sewer extensions.
Spillville	Winneshiek	April 29, 1915	Water works.
Stanton	Montgomery	September 21, 1914	Water works.
State Center	Marshall	April 17, 1915	Sanitary sewer system.
Storm Lake	Buena Vista	October 2, 1915	Sewage filters.
Strawberry Point	Clayton	October 25, 1915	Sanitary sewer system.
Tripoli	Bremer	September 29, 1914	Sanitary sewer system.
Union	Hardin	March 10, 1916	Sanitary sewer system.
Urbana	Benton	September 25, 1915	Water works.
What Cheer	Keokuk	March 10, 1915	Sanitary sewer system.
Williamsburg	Iowa	May 4, 1916	Sanitary sewer system.
Winterset	Madison	May 8, 1916	Water works improvements.
Woodbine	Harrison	February 20, 1915	Sanitary sewer system.
Yale	Guthrie	December 18, 1914	Waterworks

Totals: Water works and water works improvements 36
Sanitary sewer systems 40
Sewage treatment plants 47
New sewage filters 4

Note: All of the plans and specifications for sanitary sewer systems as above listed include plans and specifications for sewage treatment plants.

CONSULTATION SERVICE BY CORRESPONDENCE.

County	City or Town	Subject of Inquiry
Adair	Adair	Chemial outdoor closets.
	Bridgewater	Building ventilation.
	Fontanelle	Waterworks.
	Greenfield	Septic tank for private use.
Adams	Prescott	Septic tank for school building.
Allamakee	Postville	Sewage disposal.
Appanoose	Moravia	Residential sewage treatment plants.
Audubon	Audubon	Water supply tests, cesspools, sewer system.
	Exira	Sewage diposal.
Benton	Belle Plaine	Local water supply.
	Urbana	Conditional approval of plans.
	Vinton	Unsanitary conditions.
Black Hawk	La Porte City	Well for city water supply.
Boone	Audubon	Sewer system.
	Boone	Unsanitary conditions.
	Boxholm	Septic tanks.
	Madrid	Septic tanks and cesspools.
	Ogden	Sewer system.
Bremer	Readlyn	Cellar drainage, sewage disposal.
	Tripoli	Sanitary survey, water supply.
	Waverly	Sample of water.
Buena Vista	Albert City	Drains from cellars and cesspools.
	Storm Lake	Public nuisance.
	Sioux Rapids	Sewers and sewage disposal.
Butler	Aplington	Cesspools.
Calhoun	Lake City	Stream pollution, septic tanks.
	Rockwell City	Sewer system.
	Yetter	Disposal of sewage through drain.
Carroll	Carroll	Sewage disposal plant.
	Dedham	Typhoid fever epidemic.
	Lanesboro	Sand for purification plant.
	Lidderdale	Water in cellar nuisance.
Cedar	Clarence	Drainage and sewage disposal.
	Mechanicsville	Typhoid fever epidemic.
	Lowden	Plans for water works.
	Tipton	Cesspools.
	West Branch	Laws affecting slaughter-houses, sewer system
Cerro Gordo	Clear Lake	Sewer system.
	Mason City	Filter sand.
	Meservey	Plans for sewer system.
Cherokee	Aurelia	Cesspools, septic tanks, etc.
	Marcus	Installation of cesspool.
Chickasaw	Fredericksburg	Assessment for sewers.
	Lawler	Sanitary survey.
	Nashua	Chemicals used in cleaning vaults.
	New Hampton	Typhoid fever epidemic.
Clay	Peterson	Construction of septic tank.
	Spencer	Approval of plans for sewers.
Clayton	Luana	Public nuisance.
	McGregor	Sewer system.
	Monona	Cesspools.
	St. Olaf	Septic tank installation.
	Strawberry Point	Sewer system.
Clinton	Delmar	Septic tanks.
	Clinton	Typhoid epidemic.
	Grand Mound	Water supply.
Crawford	Denison	Sewer extension.
	Schleswig	Septic tank for private family.
	Vail	Septic tank for private residence.
	West Side	Septic tank.
Dallas	Adel	Typhoid epidemic.
	Dallas Center	Sewage disposal, cesspools.
	Minburn	Private disposal of sewage.
	Perry	Sewage disposal and cesspools.
	Scandia	Water supply.

OFFICE WORK—Continued.

County	City or Town	Subject of Inquiry
Davis	Bloomfield	Sewage disposal, sanitary conditions.
Decatur	Lamoni	Sewage disposal.
Delaware	Colesburg	Installation of small sewer system.
	Earlville	Sewage treatment plants.
Des Moines	Burlington	Water supply.
Dickinson	Arnolds Park	Septic tank at hotel.
	Lake Park	Air pressure system for water supply.
	Spirit Lake	Water supply for schools.
	Terrill	Sanitary matters.
Dubuque	Cesende	Sewage disposal plants.
	Dyersville	Sewer system.
Emmet	Armstrong	Septic tanks.
	Dolliver	Public water supply system.
	Estherville	Water survey.
Fayette	Arlington	Sanitary matters.
	Clermont	Private septic tanks.
	Fayette	Sewer ditched into yard.
	Hawkeye	Residential sewage treatment plants.
	Maynard	Well pollution by cesspool.
	Oelwein	Sand sample, for sewage filters.
Floyd	Charles City	Sewage disposal.
	Marble Rock	Polluted farm well.
	Nora Springs	Sewer system.
	Rockford	Cesspool under business house.
Franklin	Alexander	Waterworks.
	Hampton	Sanitary matters.
	Latimer	Digging new well.
	Sheffield	Sewer system, disposal plant.
Greene	Churdan	Private sewage disposal.
Grundy	Wellsburg	Inquiry concerning water pipes.
Guthrie	Guthrie Center	Sample of sand.
	Stuart	Installation of septic tank.
	Yale	Water supply.
Hamilton	Jewell	Sewer system.
	Stanhope	Waterworks system.
	Stratford	Sewer system.
	Webster City	Sewer system.
Hancock	Britt	Public water supply.
	Garner	Invitation to discuss sewerage.
Hardin	Ackley	Sewage treatment plant.
	Eldora	Sanitary toilets.
	Radcliffe	Cesspools.
	Union	Water supply and sanitary sewers.
Harrison	Dunlap	Cesspool contamination of wells.
	Missouri Valley	Condition of buildings.
	Pisgah	Septic tank for school.
	Woodbine	Discharge of sewage.
Henry	Mt. Pleasant	Sewage disposal plant.
	Winfield	Waterworks.
Howard	Chester	Sand for filtration of sewage.
	Cresco	Public water supply.
	Elma	Sewer system.
Humboldt	Bode	Septic tank construction.
	Bradgate	Drainage system.
	Livermore	Cesspools.
	Thor	Installation of waterworks.
Ida	Battle Creek	Unsanitary conditions.
	Holstein	Filter plant.
Iowa	Marengo	Sewer system.
	North English	Septic tanks.
	Williamsburg	Plans and specifications.
Jasper	Colfax	Petition for sanitary survey.
	Kellogg	Unsanitary conditions.
	Monroe	Unsanitary conditions.
	Newton	Sewage disposal.
	Prairie City	Sewage disposal, nuisance.
Jefferson	Batavia	Septic tanks.
Johnson	Iowa City	Sewers and sewage disposal.
	Oakdale	Survey for disposal plant.
	Solon	Sewage disposal.

OFFICE WORK—Continued.

County	City or Town	Subject of Inquiry
Jones	Onslow	Waterworks system.
	Oxford Junction	Sewer system.
	Wyoming	Sewage disposal.
Keokuk	Keota	Sand for filter bed.
	What Cheer	Sewer system.
Kossuth	Algona	Sanitary conditions.
	Burt	Plumbing ordinance.
	Swea City	Tank for creamery (septic tank).
	Whittemore	Disposal of creamery waste.
Lee	Ft. Madison	Petition for sanitary survey.
	West Point	Request to make visit.
Linn	Cedar Rapids	Starch works nuisance.
	Kenwood Park	Incompleted sewer plans.
	Lisbon	Sewer system.
	Marion	Sewage filter beds.
	Mount Vernon	Reconstruction of filter beds.
	Walker	Septic tanks for sewage disposal.
Louisa	Columbus Junction	Sewage disposal.
	Wapello	Sewer construction.
Lucas	Chariton	Sewer system, water supply.
Lyon	Rock Rapids	Request for plans and specifications.
Madison	Macksburg	Sanitary toilets.
Mahaska	Barnes City	Waterworks and sewers.
	New Sharon	Drainage nuisance.
	Oskaloosa	Sewer system and sewage disposal.
Marion	Knoxville	Waterworks system.
	Melcher	Request for information.
	Pella	Conditions of opera house.
Marshall	Laurel	Condition of well.
	Liscomb	Cesspools.
	Marshalltown	Storm sewers.
	Melbourne	Sewage disposal.
	State Center	Sample of filter sand.
Mills	Glenwood	Relative to approval of plans.
	Mineola	Private septic tank.
Mitchell	Osage	Rendering plant nuisance.
	Riceville	Discussion of plans for sewers.
	Staceyville	Public nuisance.
Monona	Blencoe	Flood and drainage conditions.
	Castana	Septic tanks.
	Mapleton	Talk on sewage disposal.
	Onawa	Plans and specifications for sewers.
	Soldier	Request to make trip.
Monroe	Albia	Sewer system.
	Maple	Sanitary survey.
Montgomery	Elliott	Sewer system.
	Villisca	Installation of septic tank.
Muscatine	Muscatine	Sand sample for sewage filters.
O'Brien	Hartley	Sewer system.
	Paullina	Plans for sewer system.
	Primghar	Sewer system.
	Sutherland	Sewer ordinances.
Osceola	Ocheyedan	Ventilation of opera house.
Page	Blanchard	Sanitary conditions.
	Clarinda	Sanitary survey.
Palo Alto	Cylinder	Effluent from septic tank.
	Ruthven	Cesspool for use of church.
Plymouth	Kingsley	River conditions.
Pocahontas	Gilmore City	Sewage disposal.
	Plover	Plans for septic tank.
	Rolfe	Sewer system.
Polk	Altoona	Drain tile used as sewer.
	Ankeny	Cost of water supply.
	Des Moines	Stream pollution.
	Mitchellville	Licensed plumbers, ordinance.
	Valley Junction	Sewer system, disposal plant.
Pottawattamie	Council Bluffs	Typhoid epidemic.
	Mecedonia	Unsanitary conditions.
	Oakland	Sewage disposal plant.

OFFICE WORK—Continued.

County	City or Town	Subject of Inquiry
Poweshiek	Brooklyn	Sewage disposal plant.
	Grinnell	Sewage disposal.
	Montezuma	Contamination of wells.
Ringgold	Benton	Septic tank.
	Kellerton	Rendering plant nuisance.
	Mt. Ayr	Sewer system.
Sac	Early	Sewer system.
	Lake View	Municipal sewer system.
	Lytton	Water supply of town.
	Schaller	Private disposal plant.
Scott	Dixon	Plans and specifications, sewer system.
Sioux	Alton	Septic tanks.
	Boyden	Waterworks system.
	Ireton	Machinery on gravel plant.
	Rock Valley	Septic tank construction.
Story	Ames	Typhoid epidemic, sand sample.
	Gilbert	Waterworks system.
	Slater	Typhoid epidemic.
Tama	Chelsea	Disposal of waste water.
	Toledo	Unsanitary condition of wells.
Taylor	Bedford	Septic tank installation.
	Clearfield	Minimum grades for sewers.
	Lenox	Criticism of plans.
Union	Creston	Approval of plans and specifications.
	Lorimor	Typhoid epidemic, test of wells.
Van Buren	Bonaparte	Plan for septic tank.
	Keosauqua	Rules and regulations.
	Milton	Open sewer on alley.
Wapello	Eldon	Sewer system.
	Ottumwa	Sand for filter purposes.
Warren	Carlisle	Proximity of vault to well.
	Indianola	Stream pollution.
	New Virginia	Disposal of sewage.
Washington	Ainsworth	Waterworks system.
	Brighton	Dumping ground.
	Riverside	Construction of well, water supply.
	Wellman	Septic tank.
Wayne	Allerton	Effluent from septic tank.
	Humeston	Waterworks.
	Seymour	Investigation of water supply.
Webster	Ft. Dodge	Serum disposal plant.
	Gowrie	Cesspools, sewers, etc.
Winnebago	Forest City	Septic tanks, city sewer system.
	Lake Mills	Sewage disposal.
Winneshiek	Calmar	Sewage filters.
	Decorah	Sewage and garbage disposal.
	Ossian	Septic tank.
Woodbury	Anthon	Disposal of sewage.
	Pierson	Septic tank for school building.
	Sioux City	Sewer extension, plumbing inspection.
	Sloan	Soapy water in septic tank.
Wright	Clarion	Sewer system.

CONFERENCES.

Practically all of the sanitary engineers engaged in designing sanitary sewer systems and sewage treatment plants have visited the office of the State Board of Health during the biennial period ending June 30, 1916, and consulted with the engineer of the board relative to such installations. The municipal authorities of several cities and towns have also availed themselves of this service.

The conferences held with the engineers of the state relative to sewer construction, and the proper design and care of sewage treatment plants, have resulted in better construction of sewers and adequate sewage treatment plants.

The co-operation of the sanitary engineers has been satisfactory. The conferences have also resulted in saving the time of all parties, and the work of the department has been made much more extensive and satisfactory thereby.

With sufficient support on the part of the state, this branch of the work could be enlarged, and made fully as effective as the field work of the engineer of the board.

SPECIAL WORK OF THE SANITARY ENGINEER.

The services of the Sanitary Engineer of the State Board of Health have been furnished to the Board of Control of State Institutions in accordance with the policy of the State Board of Health to co-operate with other state departments in all matters pertaining to sanitary installations.

Services were rendered in the following cases:

Installation of sewage treatment plant at the State Sanatorium for the Treatment of Tuberculosis, Oakdale, Iowa.

Installation of new sewage filter beds at State Hospital, Mt. Pleasant, Iowa.

Installation of sewage treatment plant at State Hospital and Colony for Epileptics, Woodward, Iowa.

Reconstruction of sewer, Penitentiary, Ft. Madison, Iowa.

Reconstruction of sewage filter beds at Industrial School for Girls, Mitchellville, Iowa.

INSTITUTIONAL SEWAGE AT OAKDALE.

During the year 1915, the Board of Control of State Institutions decided to install a new sewage treatment plant to dispose of the sewage of the State Sanatorium for the Treatment of Tuberculosis, Oakdale, to replace the old sewage treatment plant which had become inadequate. The Sanitary Engineer of the State Board of Health made the necessary surveys, and prepared plans and specifications for the new sewage treatment plant, which was installed during the early months of the year 1916.

The sewage treatment plant consists of a septic tank of the Cameron type and intermittent sand filters. Provision is also made for after sterilization of the sewage effluent.

It was considered necessary to maintain laboratory supervision of this sewage treatment plant to determine the effectiveness of the sewage treatment and filtration in disposing of tubercle bacilli which are necessarily present in large quantities in the sewage from this institution. Arrangements were made whereby weekly samples of raw sewage, septic tank effluent, and filter effluent were taken and the same were analyzed at the laboratories for the State Board of Health. These analyses were begun January 1, 1916, and were continued for a period of nine months. Analyses were made under the direct supervision of Mr. Jack J. Hinman, Jr., Chemist. The analyses indicate that the plant if properly operated will yield a non-putrescible effluent throughout practically the entire year. The tabulated report of the analyses is herewith appended.

INSTITUTIONAL SEWAGE AT MT. PLEASANT.

A Cameron septic tank with contact filters failed to accomplish the necessary purification of the sewage of the State Hospital, Mt. Pleasant, Iowa. The contact filters were abandoned, and intermittent sand filters installed which soon proved inadequate. At the request of the Board of Control of State Institutions, the engineer of the Board of Health surveyed a new location for the filters, and prepared plans and specifications for the same.

The Board of Control asked and received an appropriation of $11,000 for the construction of the filters. During the year 1915 the construction of the filters was begun, and the work was completed during the year 1916. Intermittent sand filters, four in number, were installed, totalling an area of eight-tenths of an acre. The filters are adequate to properly purify the sewage, and yield a non-putrescible effluent. It is expected that this sewage treatment plant will be placed under laboratory control.

INSTITUTIONAL SEWAGE AT WOODWARD.

The State Hospital and Colony for Epileptics required a sanitary sewer system and sewage treatment plant, and on the request of the Board of Control of State Institutions, the engineer of the State Board of Health made the necessary surveys, and prepared the necessary plans and specifications for these installations.

The sewage treatment plant consists of a housed Imhoff tank and siphon chamber with intermittent sand filters. The work was begun and completed during the year 1916. The contract price for the construction of the sewage treatment plant was $16,000. The plant as constructed provides filtration for the use of 800 people with provisions for added filtration sufficient for 2,500 people. The capacity of the Imhoff tank is sufficient for 2,500 users. It is expected that the plant will produce a non-putrescible effluent throughout the entire year.

INSTITUTIONAL SEWAGE AT FT. MADISON.

The Penitentiary at Ft. Madison discharges its sewage directly into the Mississippi River. Prior to the construction of the Keokuk dam, the outlet sewer was favorably located, discharging the sewage into the swift current of the river, but when the Keokuk dam was put into commission, the water of the river was raised about seventeen feet above the normal level. This high river stage submerged the Penitentiary sewer, so that it became necessary to construct a new sewer at a sufficient elevation to provide proper discharge for the sewage. The correction of the conditions devolved upon the Mississippi River Power Company. This company asked that the engineer of the State Board of Health, acting for the Board of Control, co-operate with the engineer of the company in determining the proper remedy, or reconstruction, of the Penitentiary sewer. The necessary surveys were made by the engineers mentioned, and the new sewer has been constructed, and is rendering satisfactory service.

INSTITUTIONAL SEWAGE AT MITCHELLVILLE.

The original sewage treatment plant consisted of a Cameron septic tank and contact filters. The contact filters were inadequate, and were soon out of commission. The contact filters were then replaced with intermittent sand filters which were soon clogged, and these in turn were replaced by rock filters which in a short time became completely fouled.

Intermittent sand filters of adequate area were then installed. These filters satisfactorily purified the sewage, yielding a non-putrescible effluent.

During 1916, the filters were cleaned, resurfaced with fresh sand and graded, and the distributing system reconstructed. There has been no difficulty in obtaining a non-putrescible effluent at any season of the year. The surveys for the reconstruction of the filter beds were made by the sanitary engineer of the Board of Health, who also supervised the construction of the beds.

ANALYSES OF

CHEMICAL RESULTS IN

Lab. Number	Source	Date	Odor	Color	Turbidity	Sediment	Nitro Free Ammonia	Nitro Alb. Ammonia
1990	Raw	1- 6-16	Foul	Sl. Gr. Br.	Marked	Organic	6.00	3.5
1991	Filters	1- 6-16	Foul	Sl. Gr. Br.	None	None	4.00	.50
2002	Raw	1-10-16	Foul	Gr. Br.	Marked	Con. Org.	2.5	12.0
2003	Filters	1-10-16	Foul	Sl. Gr. Br.	Slight	None	10.5	.75
2020	Raw	1-17-16	Foul	Sl. Gr. Br.	Marked	Consid.	6.0	4.75
2021	Filters	1-17-16	Foul	Sl. Gr. Br.	Marked	None	15.75	2.375
2035	Raw	1-24-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	12.0	2.75
2036	Tank	1-24-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	17.0	2.75
2037	Filters	1-24-16	Foul	Sl. Gr. Br.	Marked	None	15.25	1.50
2054	Raw	1-31-16	X	X	X	X	13.0	4.75
2055	Tank	1-31-16	X	X	X	X	15.0	3.75
2056	Filters	1-31-16	X	X	Marked	None	11.0	1.50
2073	Raw	2- 7-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	12.75	5.0
2074	Tank	2- 7-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	12.50	3.25
2092	Raw	2-14-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	10.25	3.50
2093	Tank	2-14-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	19.0	3.25
2094	Filters	2-14-16	Foul	Sl. Gr. Br.	Marked	None	18.50	1.62
2115	Raw	2-21-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	21.0	5.0
2116	Tank	2-21-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	14.0	3.0
2117	Filters	2-21-16	Foul	X	Turbid	None	17.0	1.0
2138	Raw	2-28-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	26.0	6.50
2139	Tank	2-28-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	23.0	3.25
2140	Filters	2-28-16	Foul	Yz. Gr. Br.	Slight	None	20.0	1.25
2159	Raw	3- 6-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	28.0	6.5
2160	Tank	3- 6-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	31.0	6.5
2161	Filters	3- 6-16	Foul	Sl. Gr. Br.	Very Slight	None	28.0	1.0
2179	Raw	3-13-16	Foul	Gr. Br.	Marked	Con. Org.	24.0	4.5
2180	Tank	3-13-16	Foul	Gr. Br.	Marked	Con. Org.	25.5	3.2
2181	Filters	3-13-16	Foul	Sl. Gr. Br.	Slight	None	26.0	2.0
2182	Creek	3-13-16	Veg.	Sl. Gr. Br.	Very Slight	Sl. Org.	.75	.20
2198	Raw	3-20-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	23.0	5.75
2199	Tank	3-20-16	Foul	Gr. Br.	Marked	Con. Org.	16.0	5.40
2200	Filters	3-20-16	Musty	Gr. Br.	Slight	Sl. Org.	17.5	0.15
2201	Creek	3-20-16	Veg.	Gr. Br.	Slight	Sl. Org.	0.32	0.1
2222	Raw	3-27-16	Foul	Gr. Br.	Marked	Organic	10.0	5.5
2223	Tank	3-27-16	Foul	Gr. Br.	Marked	Organic	8.5	2.5
2224	Filters	3-27-16	Musty	Gr. Br.	None	None	28.0	1.5
2249	Raw	4- 3-16	Foul	Gr. Br.	Marked	Con. Org.	15.0	5.0
2250	Tank	4- 3-16	Foul	Gr. Br.	Marked	Con. Org.	20.0	3.5
2251	Filters	4- 3-16	Musty	Gr. Br.	Slight	None	14.5	1.5
2252	Creek	4- 3-16	Musty	Gr. Br.	Slight	Sl. Org.	.20	.20
2272	Raw	4-10-16	Foul	Gr. Br.	Marked	Con. Fe.	14.5	3.0
2273	Tank	4-10-16	Foul	Gr. Br.	Marked	Con. Org.	18.5	5.25
2274	Filters	4-10-16	Musty	Gr. Br.	None	None	7.25	1.5
2275	Creek	4-10-16	Sl. Musty	Gr. Br.	None	None	.10	.20
2300	Raw	4-20-16	Foul	Gr. Br.	Marked	Con. Org.	5.25	2.0
2301	Tank	4-20-16	Foul	Gr. Br.	Marked	Con. Org.	20.5	2.25
2426	Raw	5-14-16	Kerosene	Sl. Gr. Br.	Marked	Con. Fe.	13.5	2.25
2427	Tank	5-14-16	Foul	Sl. Gr. Br.	Marked	Sl. Org.	27.0	2.0
2446	Raw	5-21-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	1.0	2.2
2447	Tank	5-21-16	Foul	Sl. Gr. Br.	Marked	Con. Fe.	15.0	1.5
2466	Raw	5-28-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	20.0	7.5
2467	Tank	5-28-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	6.75	3.5
2468	Filters	5-28-16	Musty	Sl. Gr. Br.	Slight	None	27.5	2.5
2500	Raw	6- 5-16	Foul	Gr. Br.	Marked	Con. Org.	4.0	3.5
2501	Tank	6- 5-16	Foul	Gr. Br.	Marked	Con. Org.	22.0	2.0
2522	Raw	6-12-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	8.25	3.25

OAKDALE SEWAGE.

PARTS PER MILLION

gen as Nitrites	Nitrates	Chlorine	Oxygen Consumed	Bacteria in 1 c. c. On Litmus Lactose Agar at 37° C.	Bacteria in 1 c. c. On Nutrient Agar at 20° C.	Bacteria in 1 c. c. Acid Colonies on L. L. Agar	Gas Formers in .001 c. c.	Relative Stability Per Cent
.015	None	52.0	62.8	120,000	280,000	30,000	Present	.....
.018	1.75	30.0	22.2	22,000	30,000	Acid	Present	99
.01	None	28.8	186.5	70,000	122,000	None	Present	.....
.02	.75	28.0	14.7	7,700	45,000	70	Present	99
.002	None	48.0	231.6	180,000	430,000	10,000	Present	.....
.004	.02	42.0	28.8	53,000	430,000	2,000	Present	11
.006	None	17.0	200.8	120,000	1,040,000	20,000	Present	.....
None	None	30.0	151.6	200,000	2,500,000	30,000	Present	.....
.01	.5	32.0	23.9	70,000	2,500,000	4,500	Present	11
.018	None	35.0	117.8	30,000	700,000	2,800	Present	.....
None	None	38.0	79.8	25,000	5,800,000	Acid Plate	Present	.....
0.15	.2	37.0	81.9	30,000	100,000	Acid Plate	Present	15
None	None	17.0	152.0	500,000	2,200,000	Acid Plate	Present	.....
.002	None	35.0	69.0	300,000	6,800,000	Acid Plate	Present	.....
None	None	51.5	196.0	200,000	2,600,000	140,000	Present	.....
None	None	38.0	76.5	140,000	6,800,000	50,000	Present	.....
None	None	40.0	20.5	40,000	6,000,000	20,000	Present	99
None	None	32.0	67.0	70,000	2,400,000	20,000	Present	.....
None	None	30.0	74.0	170,000	5,300,000	90,000	Present	.....
.02	.75	37.0	12.0	17,000	3,200,000	5,000	Present	21
None	None	49.0	276.0	70,000	2,400,000	30,000	Present	.....
None	None	31.0	32.5	120,000	4,800,000	30,000	Present	.....
.015	1.00	36.0	16.0	18,000	5,700,000	4,600	Present	75
.004	None	26.0	62.0	400,000	2,250,000	190,000	Present	.....
None	None	35.0	86.0	190,000	3,400,000	40,000	Present	.....
.02	1.0	3.50	10.5	6,500	210,000	1,600	Present	89
.004	None	24.0	38.0	620,000	2,300,000	270,000	Present	.....
None	None	26.0	59.0	990,000	7,000,000	300,000	Present	.....
.025	6.0	30.0	13.5	90,000	5,300,000	10,000	Present	99
.008	4.0	5.0	5.0	200	19,300	Absent	Absent	.....
None	None	87.0	62.5	800,000	8,630,000	620,000	Present	.....
None	None	30.0	68.5	500,000	1,130,000	270,000	Present	.....
.20	20.0	30.0	10.0	22,000	5,400,000	Acid	Present	99
.012	2.0	6.0	1.0	60	1,800	Absent	Absent	.....
Lost	4.0	20.0	62.5	130,000	2,000,000	100,000	Present	.....
Lost	9.0	13.0	22.5	80,000	1,110,000	40,000	Present	.....
Lost	15.0	12.0	1.0	1,000	190,000	400	Present (sl)	99+
.015	None	19.0	124.0	60,000	1,900,000	20,000	Present	.....
None	None	21.0	77.0	140,000	20,000,000	50,000	Present	.....
.20	20.0	20.5	10.0	16,300	3,900,000	Acid	Present	99
.01	None	4.5	10.0	65	200	Absent	Present	.....
.025	None	18.0	68.0	280,000	4,300,000	.....	Present	.....
None	None	35.0	92.0	270,000	3,100,000	100,000	Present	.....
.20	25.0	32.0	8.5	5,400	1,070,000	1,300	Present	99
.02	5.0	5.5	2.0	17	3,300	1	Absent	.....
.024	.02	20.5	160.0	2,300,000	3,400,000	Acid Plate	Present	.....
None	None	28.0	62.0	5,700,000	11,900,000	Acid Plate	Present	.....
.02	None	31.0	X	1,150,000	3,400,000	530,000	Present	.....
None	None	30.0	X	270,000	8,400,000	770,000	Present	.....
.015	None	24.0	189.5	230,000	230,000	140,000	Present	.....
.004	None	27.5	28.5	790,000	5,600,000	400,000	Present	.....
.006	None	29.0	552.0	1,900,000	3,400,000	Acid	Present	.....
None	None	25.5	69.5	800,000	5,500,000	Acid	Present	.....
.025	35.0	26.0	11.5	170,000	700,000	Absent	Present	99
.025	None	7.5	176.0	1,700,000	4,300,000	Acid	Present	.....
None	None	25.0	41.0	1,000,000	6,000,000	20,000	Present	.....
.001	None	17.5	168.0	3,000,000	5,500,000	Acid Plate	Present	.....

ANALYSES OF OAKDALE

Lab. Number	Source	Date	Odor	Color	Turbidity	Sediment	Nitro	
							Free Ammonia	Alb. Ammonia
2323	Tank	6-12-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	21.5	2.6
2324	Filters	6-12-16	Musty	Slight	Slight	None	.25	.25
2542	Raw	6-19-16	Foul	Gr. Br.	Marked	Con. Org.	10.5	7.0
2543	Tank	6-19-16	Foul	Gr. Br.	Marked	Con. Org.	33.0	5.5
2544	Filters	6-19-16	Musty	Gr. Br.	Slight	None	0.25	0.5
2501	Raw	6-26-16	Foul	Gr. Br.	Marked	Con. Org.	17.0	5.0
2502	Tank	6-26-16	Foul	Gr. Br.	Marked	Con. Org.	45.0	3.5
2503	Filters	6-26-16	Musty	Gr. Br.	None	None	6.0	0.56
2617	Raw	7-10-16	Foul	Gr. Br.	Much	Con. Org.	20.0	8.0
2618	Tank	7-10-16	Foul	Gr. Br.	Much	Con. Org.	25.0	12.0
2619	Filters	7-10-16	Sl. Foul	Gr. Br.	None	None	0.19	0.1
2651	Raw	7-17-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	11.5	5.5
2652	Tank	7-17-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	32.5	4.0
2653	Filters	7-17-16	Musty	Sl. Gr. Br.	Slight	Sl. Org.	0.25	.05
2684	Raw	7-25-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	22.0	9.0
2685	Tank	7-25-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	23.5	7.0
2686	Filters	7-25-16	Musty	Sl. Gr. Br.	None	None	0.25	1.0
2730	Raw	8- 2-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	14.5	3.0
2731	Tank	8- 2-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	37.0	5.0
2732	Filters	8- 2-16	Musty	Sl. Gr. Br.	None	None	0.25	0.25
2776	Raw	8-14-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	14.5	6.0
2777	Tank	8-14-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	22.0	9.0
2778	Filters	8-14-16	Musty	Sl. Gr. Br.	None	None	0.25	0.25
2803	Tank	8-21-16	Foul	Sl. Gr. Br.	Marked	Con. Org.	22.0	20.0
2804	Filters	8-21-16	Musty	Sl. Gr. Br.	None	None	0.15	0.1
2961	Raw	9-25-16	Foul	Gr. Br.	Vr. Much	Con. Org.	0.45	0.2
2962	Tank	9-25-16	Vr. Foul	Gr. Br.	Vr. Much	Con.Bl.Org.	32.0	3.6
2963	Filters	9-25-16	Sl. Foul	Sl. Gr. Br.	None	None	7.6	7.0
3054	Raw	10-17-16	Foul	Gr. Br.	Much	Much. Org.	10.20	2.00
3055	Tank	10-17-16	Vr. Foul	Gr. Br.	Much	Black Or.	12.00	2.40
3056	Filters	10-17-16	X	Gr. Br.	None	None	.60	.15

—SEWAGE—Continued.

gen as		Oxygen Consumed	Chlorine	Bacteria in 1 c. c.			Gas Formers in .001 c. c.	Relative Stability Per Cent
Nitrites	Nitrates			On Litmus Lactose Agar at 37° C.	On Nutrient Agar at 20° C.	Acid Colonies on L. L. Agar		
.003	None	38.0	49.6	4,700,000	23,000,000	Acid Plate	Present	.....
.03	30.0	30.0	5.0	140,000	2,000,000	20,000	Present	99+
None	None	101.0	324.0	8,300,000	14,000,000	Absent	Present	.....
None	None	33.0	74.0	1,700,000	8,400,000	Absent	Present	.....
.06	50.0	33.0	16.0	20,000	4,600,000	Absent	Present	99+
None	None	26.5	313.0	8,000,000	1,000,000	Acid Plate	Present	.....
None	None	32.0	191.0	1,680,000	2,800,000	100,000	Present	.....
0.5	50.0	28.0	8.0	X	10,000	X	Absent	99+
.008	None	29.0	153.0	4,500,000	7,000,000	Acid Plate	Present	.....
.012	None	12.0	105.0	280,000	6,000,000	90,000	Present	.....
X	30.0	40.0	14.0	30,000	2,000,000	20,000	Absent	99
.002	None	37.5	290.0	Lost	4,200,000	Lost	Present	.....
None	None	45.5	138.0	Lost	2,800,000	Lost	Present	.....
.08	75.0	42.0	12.0	24,000	540,000	Acid Plate	Present	99+
None	None	31.0	741.0	440,000	460,000	60,000	Present	.....
None	None	79.5	209.0	100,000	1,000,000	30,000	Present	.....
0.06	45.0	37.0	5.5	20,000	40,000	Absent	Absent	99+
.006	None	280.5	116.0	80,000	360,000	30,000	Present	.....
.002	None	12.0	586.0	1,900,000	7,000,000	Acid Plate	Present	.....
.06	50.0	32.5	5.5	10,000	260,000	Absent	Absent	99+
None	None	28.5	222.0	2,300,000	3,000,000	Acid Plate	Present	.....
None	None	34.0	346.0	310,000	1,400,000	50,000	Present	.....
.03	45.0	31.5	7.5	200	200	Absent	Sl. Present	99+
None	None	62.0	650.0	450,000	800,000	30,000	Present	.....
.03	70.0	81.5	10.0	280	1,810	3	Present	.....
None	0.5	63.0	X	12,000,000	12,000,000	Acid Plate	Present	.....
None	0.2	96.0	X	800,000	3,000,000	120,000	Present	.....
0.6	25.0	59.0	X	300	3,000	Absent	Present	99+
.002	.2	32.0	X	9,000,000	14,000,000	Acid Plate	Present	.....
.002	.1	75.0	X	6,000,000	1,200,000	20,000	Present	.....
.100	22.0	96.0	X	70,000	80,000	X	Present	99+

LABORATORY WORK

Report of the Director of the State Board of Health Laboratories for the Biennium

HENRY ALBERT
Director of the Laboratory

The present biennium has witnessed a marked extension in the scope of the laboratories' activities. This has chiefly been the result of an act of the 36th General Assembly, which amended the original act creating the laboratory by consolidating with it the Epidemiological laboratory of the University which had been established by the 35th General Assembly. This became effective early in 1915. At a conference between the University authorities and the State Board of Health it was decided to change the name of the laboratory from that of "Bacteriological Laboratory of the State Board of Health" to "Laboratories for the State Board of Health".

As a result of this consolidation it has been convenient, for the purposes of internal administration, to divide the activities of the laboratory into four divisions as follows: (a) Diagnostic Division, (b) Immunization Division, (c) Water Analysis Division and (d) Epidemiological Division. The first two of these represent the former Bacteriological Laboratory of the State Board of Health, while the last two divisions represent the former Epidemiological Laboratory of the University. The Diagnostic Division performs all the examinations made for the diagnosis of diphtheria, tuberculosis, typhoid fever, rabies, etc. In the Immunization Division the Pasteur anti-rabic treatment and other forms of immunization are performed. In the Water Analysis Division specimens of water, ice, and sewage are examined for the different cities, towns and Boards of Health. The Epidemiological Division undertakes by correspondence and field work to assist Local Boards of Health to control and eradicate communicable diseases within their respective jurisdictions. It must not be assumed from this that the different divisions are working independently of each other. In fact their work, by careful correlation, is closely knit together.

The staff of the laboratory has undergone several changes and additions within the past biennium. Dr. Mark F. Boyd was secured in the summer of 1915 to fill the position of Epidemiologist, and has served as Assistant Director and in the absence of the Director has acted in this capacity. He was, formerly, during 1910-12 on the staff of this laboratory as Bacteriologist, but left to become whole time Health Officer of Oskaloosa. He later pursued advanced studies in Public Health at Harvard University and the Massachusetts Institute of Technology, and later served as Associate Professor of Bacteriology and Hygiene of the University of Nevada and as member of the Nevada State Board of Health, from which position he was recalled to the staff of this laboratory: Mr. Jack J. Hinman, Jr., formerly Chemist and Bacteriologist of the Epidemiological Laboratory, has become Senior Water Chemist and Bacteriologist in charge of the Water Analysis Division. Mr. Hinman was formerly in charge of the laboratory of the Indianapolis City Board of Health. Mr. Gharret Jordan, formerly Assistant Water Analyst for the State Board of Health was secured as Junior Water Chemist and Bacteriologist in the spring of 1915. Dr. H. E. Harlow succeeded Mr. A. M. Alden in the summer of 1914 as Bacteriologist in what later became the Diagnostic Division. Dr. Harlow remained in this position one year, leaving in the summer of 1915 to enter upon the practice of medicine. Dr. Harlow was succeeded by Mr. Peter Masucci, who came from the laboratory of the Brockton (Mass.) Board of Health. Mr. Masucci left in the spring of 1916 to accept a very attractive position with the Laboratories of the H. K. Mulford Co., Philadelphia. He was succeeded by Dr. Chester Demaree, who came from the Laboratories of the Indiana State Board of Health. Dr. Demaree is in charge of both the Divisions of Diagnosis and Immunization. Mr. Leo Musgrove continues to serve the laboratory in the capacity of technician. Mr. Harvey Chensky and Mr. C. E. Ewen serve as attendants in the Diagnostic Division and Water Analysis Division respectively. Miss Minnie Hamilton continues to serve as chief clerk and stenographer. The greatly increased amount of correspondence and office work resulting from the extension of the laboratory services has necessitated the employment of another clerk and stenographer. The position was filled until the spring of 1916 by Miss Edna Stewart, who was succeeded by Miss Isabelle Berg.

Temporary positions on the staff have been filled by members of the teaching staff in Pathology and Bacteriology. Dr. A. L. Grover served as Acting Epidemiologist from the 1st of July, 1915, until the position was filled by Dr. Boyd, two months later. Dr. C. L. Bartlett served as Assistant Bacteriologist in the Diagnostic Division during the summer of 1915.

The auxiliary laboratories, or laboratories whose examinations are recognized by the State Board of Health with doctor in charge are at present as follows:

Davenport.....F. H. Lamb, M. D.
Sioux City..Jas. Christiansen, M. D.
Waterloo.....G. McConnell, M. D.
Burlington.....E. J. Wehman, M. D.
Clinton.....Jessie B. Hudson, M. D.
Cedar Rapids..James G. Ware, M. D.
Oskaloosa—Arthur Washburn, M. D.
Des Moines.....D. J. Glomset, M. D.
Ames.....R. E. Buchanan, M. D.
Little Rock.Ferdinand Smith, M. D.
Mason City.A. C. Echternacht, M. D.

These laboratories are not supported by or subsidized from the funds of the main laboratory, or by the State Board of Health, but in order that their routine examinations in diphtheria, tuberculosis and typhoid may receive official recognition, they agree to charge a fee not in excess of 25 cents for each examination of this character they make. However the laboratory at Oskaloosa is maintained by the local Board of Health and these examinations are made without cost in the interests of the local board.

WORK OF THE DIAGNOSTIC DIVISION.

Since the time of its establishment the work of the laboratory has been almost exclusively confined to the routine bacteriological diagnosis of diphtheria, tuberculosis, typhoid fever (Widal test), and rabies. This policy was followed at the direction of the Board, which recognized that the appropriations available for the laboratory support were insufficient to enable the laboratory to undertake the performance of examinations for the diagnosis of all communicable diseases for which such methods are available, as a routine measure. However, despite certain handicaps, the laboratory has always endeavored to accommodate physicians and their patients by performing additional examinations in so far as they do not interfere with the routine work.

I. DIPHTHERIA EXAMINATIONS.

During the past biennium a total of 18,597 diphtheria specimens (throat cultures) have been received, of which 6,527 were received during 1914-15 and 12,139 during 1915-16. A detailed analysis of the specimens

received and the results of their examinations is presented in Table 1. All cultures are reported as positive which show organisms corresponding to groups 0 and 1 of Wesbrook's types A B C and D. Specimens reported as diagnosis reserved do not clearly conform to the above types and have a doubtful relationship to true diphtheria bacilli. In such instances a second culture is requested and examined before a final diagnosis is reported. A certain number of specimens reach the laboratory in such condition that their examination is impossible, due either to broken test tubes, dryness, liquification or mouldiness of the media, or else show no growth after incubation. The physicians submitting such specimens are requested to submit further specimens for examination.

The diphtheria specimens received are classified under four headings (a) those received from patients for *diagnosis;* (b) those taken to determine when quarantine may be properly and safely *released;* (c) those taken from large groups of individuals for the recognition of *carriers* and (d) those received for the performance of virulence tests. Since the epidemiological division was organized the carrier cultures received have greatly increased in number and have been segregated in the classification from the routine diagnosis specimens. It will be noted that large numbers of these are received during very short spaces of time, a circumstance that sometimes taxes the resources of the laboratory to the utmost. For example, during January, 1916, during the work of Dr. Boyd of Marshalltown, 3,617 such cultures, in addition to all the ordinary routine work, were examined. The virulence tests depend upon a determination of the disease producing power of the diphtheria bacilli, a test which is performed by inoculating a guinea pig with a pure culture of the diphtheria organisms isolated from the throat culture, and observing the disease producing powers of the organism. The isolation of the diphtheria bacilli is sometimes a rather difficult matter and the test takes from six to twelve days. If performed on cultures secured from diphtheria patients who have been under quarantine for extended periods, the quarantine may be terminated if by the virulence test it can be demonstrated that the organisms are lacking in disease producing power.

TABLE 1—SPECIMENS RECEIVED FOR DIPHTHERIA EXAMINATION.

Diagnosis	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1914-15	733	1,566	2	66	2,367
1915-16	884	2,621	66	123	3,694
Total	1,617	4,187	68	189	6,061

TABLE NO. 1—Continued.

Release	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1914-15	1,127	2,860	0	104	4,091
1915-16	1,034	2,396	86	93	3,609
Total	2,161	5,256	86	197	7,700

Carrier	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1915-16	451	3,798	509	38	4,796
Total	451	3,798	509	38	4,796

Virulence Tests	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1915-16	6	34	0	0	40
Total	6	34	0	0	40

Grand total ..... 1914-15—6,458; 1915-16—12,139, 18,597

II. TYPHOID FEVER.

The Widal test is practically the exclusive aid which the laboratory has offered for the diagnosis of typhoid fever. While it is an exceedingly reliable test, yet its value is somewhat restricted because it can seldom be secured in the early stages of the disease, rarely before the fifth day of illness. During the biennium 4,353 Widal specimens have been received of which 2,145 were received in 1914-15 and 2,208 in 1915-16. A tabular summary of the results obtained with these specimens is given in Table 2. A few specimens of feces and urine have been examined culturally in searches to detect typhoid carriers. The cultural method of examining feces and urine of suspected cases of typhoid fever in the early stages

of the disease offers one of the most satisfactory methods for the early diagnosis of the disease. The laboratory desires to provide sufficient suitable containers for the transmission of specimens of feces and urine and secure additional assistance to enable it to offer this test to physicians, which at present, owing to insufficient funds, it is unable to do.

TABLE 2—SPECIMENS RECEIVED FOR THE DIAGNOSIS OF TYPHOID FEVER.

Widal	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1914-15	477	1,658	3	7	2,145
1915-16	470	1,582	141	15	2,208
Total	547	3,240	144	22	4,353

Cultural Examinations—Feces and Urine.

1914-15	5
1915-16	14
Total	19
Grand total	4,372

III. TUBERCULOSIS.

The examination of sputum for the detection of tubercle bacilli as an aid in the diagnosis of pulmonary tuberculosis and of following the progress of the disease has been the chief work performed in connection with tuberculosis. During the biennium 6,612 specimens of sputum have been received for this purpose. The results of the examinations are shown in Table 3. A smaller number of specimens of feces and urine have been received for the diagnosis of genito-urinary tuberculosis and about the same number of specimens of pus. A few specimens of spinal fluid were received for the detection of tubercle bacilli therein. The results of these examinations are presented in the above table. Two specimens of cow's milk have been received for the detection of tubercle bacilli. The laboratory does not consider it proper to encourage the submission of milk samples for this purpose, because the examination of a sample of milk from a tuberculous cow is apt to give negative results as a result of the intermittent manner in which the bacilli are excreted in the milk and because their numbers are frequently scanty. In all such instances the parties submitting the specimens have been advised to have a veterinarian perform the tuberculin test upon the suspected cow.

TABLE 3—SPECIMENS RECEIVED FOR THE DIAGNOSIS OF TUBERCULOSIS.

Sputum	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1914-15	546	2,664	0	28	3,238
1915-16	640	2,654	60	27	3,381
Total	1,186	5,318	60	55	6,619

Feces and Urine	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1914-15	0	16	0	0	16
1915-16	3	11	2	0	16
Total	3	27	2	0	32

Pus	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1914-15	1	14	0	0	15
1915-16	1	13	0	0	14
Total	2	27	0	0	29

Milk	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1915-16	0	1	0	1	2
Total	0	1	0	1	2

TABLE NO. 3—Continued.

Spinal Fluid	Positive	Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
1915-16	1	5	0	0	6
Total	1	5	0	0	6

Grand total ..... 6,681—1914-15, 3,269; 1915-16, 3,412

IV. RABIES.

Rabies has been quite widespread in Iowa for a number of years and in certain localities the infection has persisted for some time. The number of specimens submitted to the laboratory for the diagnosis of rabies is subject to considerable monthly fluctuations and, inasmuch as the examination is one requiring considerable time, these specimens cause at times quite a pressure of work. In a considerable percentage of instances it is impossible to make a diagnosis from the laboratory examination, since the suspected animal had not been permitted to die a natural death, but was immediately killed and sent to the laboratory. Because of this difficulty, it is highly desirable that every one understand that a dog suspected to be infected with rabies should be kept confined for a period of ten days instead of being killed. Rabies is always fatal after a brief illness and following natural death from the disease laboratory examinations are usually positive. If, however, the animal is killed in the early stages of the disease the examination may be unsatisfactory and inconclusive.

Upon receipt of a brain, smears of the hippocampus major are searched for Negri bodies, which if found, make the diagnosis positive. If none are found guinea pigs or rabbits are inoculated intracranially with a portion of the suspected brain, providing a supply of these animals is available at the time. If none are available a diagnosis is made from the history, including the symptoms manifested by the dog and the circumstances which led to the biting. A certain number of specimens are received in hot weather which were not iced before shipment. In these instances the brain has usually reached such an advanced stage of decomposition by the time it is received that examination is impossible. Table 4 presents a summary of the specimens which have been received for a diagnosis of rabies and the results of the examination. The brains of all kinds of domestic animals have been received for examination, as shown by Table 5. The localities in the state from which positive specimens have been received is shown in Fig. 1.

TABLE 4—SPECIMENS RECEIVED FOR THE DIAGNOSIS OF RABIES.

Year	Positive by			Negative	Diagnosis Reserved	Specimens unsuitable for examination	Total
	Negri Bodies	Innoculation	History				
1914-15	32	1	15	33	0	0	81
1915-16	10	2	14	33	0	6	65
Total	42	3	29	66	0	6	146

TABLE 5—CHARACTER OF ANIMALS EXAMINED FOR DIAGNOSIS OF RABIES.

Animal	Positive by			Negative	Specimens unsuitable for examination	Total
	Negri bodies	Inoculation	History			
Dogs	34	2	28	50	4	118
Cats	4	1	1	5	2	13
Cattle	2	0	0	8	0	10
Sheep	0	0	0	1	0	1
Swine	1	0	0	1	0	2
Horses	0	0	0	0	0	0
Squirrels	0	0	0	1	0	1
Skunks	1	0	0	0	0	1
Wolves	0	0	0	0	0	0
Total	42	3	29	66	6	146

V. MENINGOCOCCIC MENINGITIS.

A few specimens (11) of spinal fluid have been received for the detection of meningococci. The results of these are presented in Table 6.

VI. GONORRHOEA.

A considerable number of smears (173) of urethral pus have been received for the detection of gonoccocci. The results of these examinations are presented in Table 7. A few cultural examinations for the diagnosis of this disease have been made upon material collected from patients who presented themselves at the laboratory.

TABLE 6—SPECIMENS RECEIVED FOR DIAGNOSIS OF MENINGOCOCCIC MENINGITIS

Spinal Fluid	Positive	Negative	Diagnosis reserved	Specimens unsuitable for examination	Total
1914-15	0	2	0	0	2
1915-16	2	5	2	0	9
Total	2	7	2	0	11

TABLE 7—SPECIMENS RECEIVED FOR THE DIAGNOSIS OF GONORRHOEA.

Smears	Positive	Negative	Diagnosis reserved	Specimens unsuitable for examination.	Total
1914-15	17	54	6	0	77
1915-16	27	63	5	1	96
Total	44	117	11	1	173

Cultures	Positive	Negative	Diagnosis reserved	Specimens unsuitable for examination	Total
1914-15	0	0	0	0	0
1915-16	1	4	2	0	7
Total	1	4	2	0	7
Grand total					180

VII. MISCELLANEOUS EXAMINATIONS.

Under the heading miscellaneous bacteriological examinations are included a considerable variety of determinations, the number of which, in each class has been small. These are presented in Table 8. They include examinations for the diagnosis of malaria, amoebic dysentery, syphilis, various pyogenic infections, anthrax, glanders and hemorrhagic septicemia. In this group are also included a few urinalyses, gastric analysis, blood counts and similar clinical examinations.

TABLE 8—MISCELLANEOUS SPECIMENS RECEIVED FOR EXAMINATION.

1914-15	66
1915-16	280
Grand total	346

VIII. WATER EXAMINATIONS.

Previous to the establishment of the Division of Water Analysis, 90 bacteriological examinations of water specimens had been made in this division during the year 1914-15.

With the establishment of the Division of Water Analysis however, the performance of examinations of this character in this division has been discontinued, since more complete facilities are offered elsewhere.

IX. AUXILIARY LABORATORIES.

The eleven auxiliary laboratories chiefly confine their Board of Health work to the three routine examinations for the diagnosis of tuberculosis, diphtheria and typhoid fever. The reports of these laboratories which have been received from the bacteriologists in charge are summarized in Table 9. The work of these laboratories is of great importance, since they permit the physicians in their vicinity to obtain reports on specimens with less delay than sometimes occurs when specimens are forwarded from remote parts of the state to the central laboratory.

TABLE 9—EXAMINATIONS MADE AT THE AUXILIARY LABORATORIES.

Locality	Diphtheria		Typhoid		Tuberculosis		Miscellaneous		Total	
	1914-15	1915-16	1914-15	1915-16	1914-15	1915-16	1914-15	1915-16	1914-15	1915-16
Sioux City	68	380	1	3	12	9	0	0	81	392
Burlington	125	207	47	75	44	102	0	0	216	384
Waterloo	85	87	0	17	3	66	0	0	88	170
Davenport	125	178	5	13	27	22	0	0	157	213
Clinton	39	23	7	6	11	27	0	0	57	56
Cedar Rapids	20	185	0	102	20	110	60	686	100	1,083
Oskaloosa	6	13	7	0	18	1	4	21	35	35
Des Moines	530	276	0	0	0	0	0	0	530	276
Ames	10	21	0	17	21	13	21	1	52	52
Little Rock	43	29	1	4	19	8	6	2	69	43
Mason City	0	73	0	0	0	38	0	1,442	-------	1,553
Total	1,051	1,472	68	237	175	396	91	2,152	1,385	4,257
Combined total biennium	2,523		305		571		2,243		5,642	

X. PREPARATION AND DISTRIBUTION OF OUTFITS.

One of the important activities of the diagnostic division consists in the preparation of and distribution of outfits. These consists of a suitable container for the collection of the specimen and a mailing case for transmission through the mails in a satisfactory manner in compliance with the postal regulations. The diphtheria outfit consists of a culture tube of sterile blood serum media. Two sterile swabs and a data card and directions enclosed in double mailing tube. The tuberculosis outfit consists of a small cork stoppered vial of about 30 c.c. capacity containing about 10 c.c. of carbolic acid solution and a data blank with directions, enclosed in a double mailing case. The typhoid outfit consists of a square of aluminum foil, data blank, and sheet of directions, enclosed in an envelope. Recently, aluminum plates have been substituted in this outfit for the squares of foil. With the exception of the blood serum media included in the diphtheria outfit this work is altogether one of assembling and putting together the separate parts. However, the blood serum media and swabs included in the diphtheria outfit necessitates the preparation of these materials in the laboratory, a process, which takes considerable time. The used outfits are cleaned, sterilized, fresh supplies placed in them and sent into circulation again.

During the biennial period 812 stations for the distribution of laboratory outfits have been maintained in 683 cities and towns. These have been furnished with the following quantities of outfits:

OUTFITS DISTRIBUTED.

Years 1914-1915.

Diphtheria	14,473
Typhoid (Widal)	1,625
Tuberculosis	4,174
Total	20,272

Year 1915-1916.

Diphtheria	13,451
Typhoid (Widal)	2,025
Tuberculosis	5,320
Total	20,796
Grand Total	41,068

The number of diphtheria outfits stated above does not include those furnished the epidemiological division for field use in connection with measures to control disease outbreaks.

In towns having only one physician a station is not maintained, but the physician is supplied directly with outfits from the laboratory.

WORK OF THE DIVISION OF IMMUNIZATION.

As in the past the chief work of this division has been the administration of the Pasteur treatment for the prevention of rabies, although several anti-typhoid and anti-smallpox inoculations have been given. Table 10 shows by months the number of persons who have received immunizing treatments during the present biennium.

Ninety-six persons have been given the Pasteur anti-rabic treatment. The course of the treatment which covers twenty-one days, consists of

twenty-five injections, making a total of 2400 inoculations given in the course of this work. The antirabic vaccine used in the immunization of these patients has been furnished the laboratory by the Hygienic Laboratory of the United States Public Health Service.

Table 11 shows the kind of animals which exposed the patients to infection and also the basis upon which a diagnosis of rabies was made.

In every instance the immunization has been successful and none of the patients have contracted rabies. Reports are received from the patients three months after the completion of the treatment, stating their condition at that time. No complications occurred during the course of the treatments.

One hundred and fifteen persons, chiefly students, have been given the immunizing treatment against typhoid fever. The course of this treatment consists of three inoculations given one week apart, a total of three hundred and forty-five inoculations.

Twenty-nine persons, chiefly medical students, received anti-smallpox vaccination during 1915 while smallpox was prevalent in Iowa City.

TABLE NO. 10.

Persons Receiving Immunizing Treatment During 1914-1915.

1914.	Anti-Rabic.	Anti-Typhoid.	Anti-Smallpox.	
July	9	0	0	
August	10	0	0	
September	9	0	0	
October	0	0	0	
November	0	3	0	
December	2	49	0	
1915.				
January	0	68	0	
February	1	1	0	
March	2	0	0	
April	1	0	0	
May	1	0	0	
June	4	0	0	
Total	30 (x25=750)	121 (x3=363)	0	Total 1113

1915.	Anti-Rabic.	Anti-Typhoid.	Anti-Smallpox.	
July	9	0	0	
August	10	0	0	
September	6	0	0	
October	5	9	12	
November	2	43	5	
December	12	61	11	
1916.				
January	7	0	0	
February	1	0	1	
March	4	0	0	
April	3	0	0	
May	6	2	0	
June	1	0	0	
Total	66(x25=1650)	115 (x3=345)	29	Total 2024
				Grand total 3137

TABLE NO. 11.

Persons Receiving the Anti-Rabic Immunization (Pasteur Treatment).

Showing the kind of animal from whom the patients were exposed to infection and the basis upon which the diagnosis of Rabies in the infecting animal was made.

	Negri bodies.	Animal inoculation.	History.	Total
Dogs	47	1	33	83
Cats	7	1	2	10
Cattle	0	0	0	0
Swine	0	0	0	0
Sheep	0	0	2	2
Horses	0	0	0	0
Squirrels	0	0	0	0
Skunks	1	0	0	1
Wolves	0	0	0	0
	55	2	39	96

Patients treated 1914-15 30
Patients treated 1915-16 66

WORK OF THE WATER ANALYSIS DIVISION.

The Water Laboratory was opened at Iowa City in February, 1914, as the State Epidemiological Laboratory. The 36th General Assembly reorganized the laboratory and connected it with the bacteriological laboratory. From its founding until the reorganization, July 1, 1915, there had been examined 1,366 samples of water and during the period from July 1, 1915, to July 1, 1916, there have been 1,221 samples examined.

Prior to May, 1915, the work was done gratuitously, but since that time in accordance with the act of the assembly a nominal fee has been charged. The law states that this fee may not exceed two dollars per sample, and the fee has been placed at one dollar.

Under the old arrangement, the present senior water bacteriologist and chemist Mr. Jack Hinman, Jr., under the title of assistant director, performed all of the analytical work with the assistance of a student laboratory assistant. In July, 1915, Mr. W. G. Jordan was engaged as junior water bacteriologist and chemist. He has assisted Mr. Hinman since that time. Mr. C. E. Ewen has acted as laboratory assistant during the school year of 1915-1916.

There is great opportunity for the Water Laboratory in Iowa. We have endeavored to bring the laboratory and its work before the people of the state from time to time—but many are as yet ignorant of its existence. A glance at the spot map of towns sending specimens of water (Figure —) will show how few—comparatively—have taken advantage of the services offered. The capacity of the laboratory was purposely made quite large. Double the number of samples which have been analyzed during the past year could be examined with little expense for

increased equipment. From the number of specimens received during the latter part of the last fiscal year, it is safe to assume that next year will show a large gain in the number of examinations and that the field of usefulness of the laboratory will be considerably broadened. It is earnestly hoped to carry on as large an amount of work as is possible since it is desired to make the laboratory of maximum usefulness to the people of Iowa.

The real need for examinations of the sort undertaken is well understood and is vouched for by epidemiologists and other members of the medical profession as well as by sanitary engineers. It is very necessary to know what well or spring is spreading disease in an urban or rural community in order that the trouble may be stopped. It is also important to know the condition of public water supplies of cities and towns to prevent the use of a polluted and dangerous water which may occasion an epidemic, or, if the water be good, to inform the public that the water may be used without fear. The work of the laboratory is therefore both remedial and preventive in its scope.

Those persons who are entrusted with the furnishing of a potable water to their communities should realize that their responsibility to furnish a safe water extends to every minute in every twenty-four hours. They should not allow the operation of their plants to be carelessly handled by rule-of-thumb methods and they should frequently assure themselves that the water furnished by the plant—as well as that delivered near the nead ends of the mains is satisfactory in every regard. The laboratory stands ever ready to help them in their work. Many of the operators of the larger plants understand this and have availed themselves of the services of the laboratory.

Any well or spring may become the focus of an epidemic of typhoid fever or other intestinal disease. For that reason wells and springs used by hotels, restaurants, and rural communities as well as those belonging to individuals are subject to examination in the interest of the public health. Where the attending physician or the householder, himself, suspects a well of being the cause of sickness or by reason of unsanitary surroundings suspects it of being polluted, the laboratory is ready to make an examination and, if possible, to suggest a remedy where bad conditions are found.

The laboratory is also prepared to make examinations of sewage and of sewage plant effluants for the different communities to determine the degree of purification attained.

Thus far the laboratory has confined itself to the making of sanitary examinations of water and sewage. It is hoped that as the laboratory grows, funds may become available to allow the making of mineral examinations of the water of various public supplies. It is realized that such examinations are not strictly in the interest of the public health and they have not been attempted thus far. The frequent requests for medicinal mineral analyses have been refused on the same ground.

For persons inquiring about examinations or desiring them made, we have prepared a return postal card form. This sets forth an abbreviated statement of the rules under which examination may be made and also provides an application blank upon the return card. This contains space for a signed agreement to the conditions imposed and also a space for an endorsement by the local Board of Health.

UNIVERSITY OF IOWA—LABORATORIES FOR THE STATE BOARD OF HEALTH, IOWA CITY.

Regulations Regarding Water Examinations.

1. The laboratory shall make "examinations of water whenever requested so to do by the State Board of Health, any State Institution or any citizen, school or municipality when in the judgment of the Local Board of Health such is necessary in the interest of the public health and for the purpose of preventing epidemics of disease."

When a water examination is desired, a request for a water container and directions for the collection and the sending of the specimen should first be sent to the laboratory. Such a request from a citizen, school or municipality should have the written endorsement of the Local Board of Health. In such cases a copy of the report will be sent to both the sender of the specimen and the Local Board of Health.

2. A fee of $1.00 per sample, to cover cost of examination, will be charged for all examinations of water sent to the laboratory in the usual manner. A check, draft, warrant or money order for that amount made payable to "Director, Laboratory for Water Analysis" should accompany the filled-out data blank which must accompany every specimen of water submitted for examination. In addition to this fee, the sender of the water must pay transportation charges for the water container both from and to the laboratory.

3. Address all communications regarding water examinations to, Director, State Board of Health Laboratories, University of Iowa, Iowa City, Iowa.

UNIVERSITY OF IOWA—LABORATORIES FOR THE STATE BOARD OF HEALTH, IOWA CITY.

Application for Water Analysis.

Name of town.....
From public or private supply?.....
Is water suspected of causing disease?.....
Number of containers wanted?.....

It is understood that the cost of analysis ($1.00 per sample) and transportation charges on containers are to be paid by the sender, and that the water is to be collected exactly as directed.

Signature .....
Address.....
Address to which bottles are to be sent if other than above:
.....
.....

To be Filled Out by Local Board of Health.

We recommend that in the interest of the public health an examination of the above-mentioned water be made.

Board of Health of.....
Per.....

To be Filled Out at the Laboratory.

Applications received .....
Containers forwarded .....
.....Containers, Nos. .....
Initials.

For general use we have also a post card form which does not contain the statement of the rules. This is convenient for sending out in letters.

We require the fee to be paid before the report is forwarded, since we find that this procedure lowers our expenses for collection and as well hastens the forwarding of the fees. Although it is usual to send the fee at the same time the sample is forwarded, it is, however, necessary to provide a form card for those persons who neglect to do so.

STATE UNIVERSITY OF IOWA—LABORATORIES FOR THE IOWA STATE BOARD OF HEALTH, IOWA CITY, IOWA.

We have received.....sample.... of water from you for examination and will give the same our prompt attention.

We are required to have the fee for the examination before the report is sent. In accordance with an act of the last General Assembly a fee of $1.00 is charged for each sample examined.

Reports will go forward as soon as possible after receiving the remittance. Payment should be made by check or draft drawn to the order of "Director, Laboratory for Water Analysis."

HENRY ALBERT, Director.

Our containers are large and quite expensive, costing in the neighborhood of two dollars each. We have had eighty-seven of them made from time to time. They are heavy and durable and our breakage of the bottles shipped in them has been surprisingly small. Because of the limited number we are not able to supply containers to the local Board of Health Stations for stock purposes as is commonly done with the outfits supplied by the Diagnostic Division for diphtheria, tuberculosis and typhoid specimens.

A notification card is sent to the addresses by mail on the same day that the empty container is sent to him by express. This card emphasizes the need for an immediate return of the containers.

STATE UNIVERSITY OF IOWA, IOWA CITY, LABORATORY STATE BOARD OF HEALTH.

.....191....

We are sending you today by.....express company.....bottle....., number..... for the collection of water for examination. Explicit directions, etc., will be found in the tag envelope. In case of breakage by yourself or by the company, *please notify us at once.*

Please attend to the matter at once, as we have not a sufficient number of outfits to permit of their being retained more than a day or two at most.

The results of sanitary analysis can usually be reported within 10 days after the sample is received.

Very truly yours,
HENRY ALBERT, Director.

Most persons receiving containers comply with the request to return them as soon as possible. Occasionally the containers are held for a considerable period. In order to keep the containers in circulation, at the end of every month, we send a notice to all persons who have held containers longer than one month. The notification is given on the following form.

STATE UNIVERSITY OF IOWA—LABORATORIES FOR THE IOWA STATE BOARD OF HEALTH, IOWA CITY, IOWA.

.....191....

On.....191..., we shipped you.....water container.. No. ..... by.....Express Company. The .....container.. remain... charged to you on our books. We have only a limited number of these containers and the prompt return of containers is therefore necessary. If you do not care to send a sample of water at this time, please return the empty container.. by express prepaid or inform us regarding your proposed use of same.

HENRY ALBERT, Director.

.....Notification.

When a fee for a sample is received a receipt is made and sent with the report upon the sample. A carbon copy of the receipt is kept at the laboratory. A record is kept of all samples examined and at the end of the month a statement of the accounts due and moneys received is made to the secretary of the university. A check for the amount received is also handed to him for transmission to the Secretary of State at Des Moines.

THE PERRY INVESTIGATION.

During the progress of joint survey of Dallas county in 1915 by the United States Public Health Service and the Iowa State Board of Health, the laboratory was requested to send an analyst and field laboratory to aid in the work. Accordingly Mr. W. G. Jordan was sent with the necessary equipment to carry on the work. Upon his return to the laboratory at Iowa City, Mr. Jordan made the following report to Dr. Sumner:

Iowa City, Iowa, November 1, 1915.

Dr. G. H. Sumner, Secretary-Executive Officer:

I beg leave to submit the following results of the investigation of the water supply of Dallas county, made by your order and conducted from Sept. 15 to Oct. 20, 1915. This investigation was made in connection with the sanitary survey of that county under the auspices of the U. S. Public Health Service, and the Iowa State Board of Health.

During the survey, samples from one hundred eight (108) wells and one from a spring were analyzed bacteriologically, making a total of one hundred nine (109) examinations. Of this number forty (40) samples showed no evidence of contamination with sewage material while sixty-nine (69) specimens gave positive tests for B. coli.—thus indicating sewage pollution.

The following table gives the essential data and results obtained at the field laboratory at Perry, Iowa:

Resident	Town	Date sample collect	Kind of well	Depth, feet	Top	Distance to privy, feet	Bacteria per cc: Rm. temp. 48 hrs.	Bacteria per cc: 37°C 24 hrs	Acid vol. per cc 24 hrs.	Gas forms on 1 cc of sample 48 hrs.	B. coli.
G. W. Miller	Minburn	9-24-15	Dug	20	Tight	30	12	0	0	+	-
Geo. Howard	Minburn	9-24-15	Bored	26	Tight	35	70	0	0	+	-
Mrs. A. G. Smith	Minburn	9-24-15	Bored	20	Tight	75	170	0	0	-	-
W. A. Clement	Minburn	9-24-15	Dug	12	Loose	40	1,500	0	0	+	-
T. H. Wilson	Minburn	9-24-15	Dug	14	Tight	50	31	0	0	+	-
L. T. Wallace	Minburn	9-24-15	Dug	20	Tight	30	33	0	0	+	-
Mrs. T. Shannon	Minburn	9-24-15	Bored	31	Tight	50	1,400	0	0	+	-
Frank Waholtz	Minburn	9-24-15	Dug	20	Tight	50	21	0	0	+	-
O. J. Belden	Minburn	9-24-15	Bored	20	Tight	40	27	0	0	+	-
A. Jansen	Minburn	9-24-15	Bored	80	Loose	20	1,500	1	1	+	+
Geo. Shirley	Minburn	9-24-15	Dug	40	Loose	15	120	0	0	+	+
Jacob Smith	Woodward	9-28-15	Bored	?	Loose	35	375	170	7	+	+
John Smith	Woodward	9-28-15	Bored	40	Tight	35	32	21	3	+	+
John Porter	Woodward	9-28-15	Bored	35	Tight	30	4	0	0	+	-
J. F. Geisinger	Woodward	9-28-15	Bored	40	Tight	35	20	29	0	+	-
Wm. Todd	Woodward	9-28-15	Bored	30	Tight	30	55	47	0	+	-
Albert Webster	Woodward	9-28-15	Drilled	30	Tight	50	23	1	0	+	-
Mrs. Ida Olsen	Woodward	10- 5-15	Bored	58	Tight	65	60	12	0	+	-
Simon Lamaster	Woodward	10- 5-15	Drilled	?	Tight	60	8	7	1	+	-
J. G. Bralsma	Woodward	10- 5-15	Drilled	90	Tight	100	3	6	2	+	-
Ole Olsen	Woodward	10- 5-15	Bored	?	Tight	50	6	3	0	+	-
Harry Staker	Woodward	10- 5-15	Bored	?	Tight	50	150	17	1	+	-
F. E. Pierce	Woodward	10- 5-15	Bored	75	Tight	40	850	400	Acid	+	+
S. A. Remsey	Woodward	10- 5-15	Bored	30	Tight	30	5	14	0	-	-
Egan Bros.	Woodward	10-14-15	Bored	?	Tight	50	425	32	1	+	-
Wade	Woodward	10-14-15	?	?	?	?	7	3	1	+	-
W. A. Staper	Redfield	10- 6-15	Drilled	25	Loose	60	4	55	2	+	+
I. W. Higgins	Redfield	10- 6-15	?	?	Loose	100	43	9	1	+	-
G. T. Johnson	Redfield	10- 6-15	Dug	?	Tight	75	35	6	0	+	-
A. L. Cunningham	Redfield	10- 6-15	Dug	25	Tight	75	6	5	1	+	-
B. F. Haber	Redfield	10- 6-15	Dug	56	Tight	20	230	230	2	+	+
L. N. Martin	Redfield	10- 6-15	Dug	40	Tight	40	70	270	1	+	+
G. Cave	Redfield	10- 6-15	Dug	25	Tight	50	26	5	0	+	+
Chas. Mabbitt	Redfield	10- 6-15	Dug	?	Tight	50	475	12	4	+	+
J. Anderson	Redfield	10- 6-15	Dug	20	Tight	75	4	412	0	+	+
Pat. Johnson	Redfield	10- 6-15	Dug	?	Tight	25	22	320	Acid	+	+
G. E. Styles	Redfield	10- 6-15	Dug	22	Tight	20	200	350	8	+	+
M. McCleary	Dexter	10- 8-15	Bored	52	Tight	40	60	70	0	+	+
Mrs. E. Bennett	Dexter	10- 8-15	Bored	30	Tight	60	50	6	0	+	+
Weston George	Dexter	10- 8-15	Bored	30	Tight	75	70	7	0	+	+
Mrs. Al Campbell	Dexter	10- 8-15	Bored	30	Tight	35	180	30	0	+	+
John Yeaple	Dexter	10- 8-15	Bored	2	Tight	40	95	21	1	+	+
B. C. Templin	Dexter	10- 8-15	Bored	20	Tight	20	80	11	0	+	+
C. H. Boot	Dexter	10- 8-15	Dug	20	Tight	75	85	70	2	+	+
Dr. Winsell	Dexter	10- 8-15	Dug	85	Tight	50	210	100	12	+	+
W. C. Pugh	Dexter	10- 8-15	Dug	?	Tight	15	32	9	1	+	+
R. D. Harris	Dexter	10- 8-15	Bored	?	Tight	40	25	10	0	+	+
Well No. 1	High Bridge	10- 2-15	?	?	Loose	90	95	55	1	+	+
Well No. 2	High Bridge	10- 2-15	?	?	Tight	60	900	90	1	+	+
Well No. 3	High Bridge	10- 2-15	?	?	Tight	45	275	26	5	+	+
Well No. 4	High Bridge	10- 2-15	?	?	Tight	55	220	5	0	+	+
A. W. Stritzman	Dallas Center	10- 4-15	Bored	25	Loose	180	80	15	0	+	+
Henrietta Cramer	Dallas Center	10- 4-15	Dug	65	Loose	30	75	55	5	re+	+
Uperdaff's Drug Store	Dallas Center	10- 4-15	Dug	?	Tight	30	14	3	0	-	-
O. W. Syford	Dallas Center	10- 4-15	Bored	60	Loose	30	230	10	0	+	+
Clyde Brenton	Dallas Center	10- 4-15	Bored	?	Tight	60	8	7	1	+	+
H. M. Water	Perry	10- 2-15	Bored	30	Tight	40	87	4	0	+	+
H. M. Townsen	Perry	10- 2-15	Dug	20	Tight	30	220	11	2	+	+
J. Clerg	Perry	10- 2-15	Bored	30	Tight	10	4	2	0	+	+
P. Asek	Perry	10- 2-15	Dug	60	Loose	60	2,100	240	Acid	+	+
L. J. Rice	Perry	10- 2-15	Dug	30	Tight	50	28	2	0	+	+
J. M. Shaw	Perry	10- 2-15	Bored	45	Tight	40	480	9	1	+	+
P. Steption	Perry	10- 2-15	Bored	?	Tight	50	55	9	1	+	+
L. Kenyon	Perry	10- 2-15	Driven	?	Loose	60	6	1	0	+	+
Mrs. A. J. Bishop	Perry	10- 2-15	Bored	?	Tight	75	150	3	0	re	+
Nina Johnson	Perry	10- 2-15	Bored	?	Tight	50	180	5	0	+	+
Hotel	Dawson	10-11-15	Dug	?	Loose	90	80	20	4	+	+
J. W. Anderson	Dawson	10-11-15	Drived	?	Tight	100	39	2	0	+	+
P. S. Witter	Dawson	10-11-15	Drilled	280	Tight	75	11	10	4	+	+
J. R. Allen	Dawson	10-11-15	Dug	42	Tight	50	9	7	1	+	+
L. B. Carlisle	Dawson	10-11-15	Drilled	70	Tight	50	120	2	0	+	+
W. A. McCory	Dawson	10-11-15	Dug	?	Loose	25	80	48	4	+	+
Lewis & Brown	Dawson	10-11-15	Dug	?	Tight	200	100	18	2	+	+
E. R. Burkett	Granger	10-13-15	Bored	70	Tight	100	50	1	1	+	+
C. Buckley	Granger	10-13-15	Bored	?	Tight	25	30	14	3	+	+
Ira Wilson	Granger	10-13-15	Bored	40	Tight	100	250	46	0	+	+
Chas. DeNise	Granger	10-13-15	Bored	80	Loose	50	300	4	1	+	-
D. O. Cunningham	Granger	10-13-15	Bored	70	Tight	60	180	1	0	+	-
S. L. Wall	Granger	10-13-15	Bored	?	Tight	100	285	60	2	+	+

Resident	Town	Date sample collected	Kind of well	Depth, feet	Top	Distance to privy, feet	Bacteria per cc. Rm. temp. 48 hrs.		Acid col. per cc 24 hrs.	Gas forms on 1 cc of sample 48 hrs.	B. coli.
R. E. William	Granger	10-13-15	Bored	65	Loose	100	110	27	0	+	+
Wm. Andrews	Granger	10-13-15	Bored	31	Tight	75	110	28	0	+	+
August Graham	Bouton	10-14-15	Bored	35	Loose	60	2	2	0	—	—
W. R. Phelps	Bouton	10-14-15	Dug	40	Loose	60	1	1	—	—	—
Mrs. Mary Wolver	Bouton	10-14-15	Drilled	85	Tight	200	270	28	1	—	—
Nicholas Hock	Bouton	10-14-15	Drilled	50	Loose	150	1,600	80	1	—	—
Peter Hansen	Bouton	10-14-15	Drilled	80	Tight	50	470	22	2	+	+
E. R. Dierks	Bouton	10-14-15	Drilled	?	Loose	50	20	3	—	+	+
Appenzeller Co., 2½ mi. ne.	Perry	10-14-15	?	?	Tight	200	2,100	4	0	—	—
M. B. Ball	Waukee	10-15-15	Bored	55	Loose	100	90	26	1	+	+
F. M. Buck	Waukee	10-15-15	Bored	?	Tight	75	22	8	0	—	—
Mrs. Jessie Pares	Waukee	10-15-15	Dug	?	Loose	70	800	60	0	—	—
Geo. Myers	Waukee	10-15-15	Bored	40	Tight	100	2,800	25	0	+	+
F. J. Stevenson	Waukee	10-15-15	Bored	?	Loose	60	210	36	7	+	+
B. J. Jones	Waukee	10-15-15	Bored	40	Tight	50	180	45	5	+	+
Albert Davis	Waukee	10-15-15	Bored	?	Tight	60	120	27	3	+	+
R. W. Wilson	Waukee	10-15-15	Bored	72	Tight	75	15	5	—	—	—
Source—											
Town Well	Minburn	9-24-15	Bored	-----	Tight	200	13	0	0	—	—
City well (tap Carter bldg.)	Perry	10-15-15	Bored	1200	Approx	gd. 200	100	22	0	—	—
City water (Pumping Sta.)	Perry	10-15-15					150	4	0	—	—
City well (tap Cent. bldg.)	Perry	10- 2-15					47	200	0	—	—
Town well	Dallas Center	10- 4-15	Bored	-----	Tight	200	38	17	0	+	+
Town well	Dexter	10- 8-15	Bored	-----	Tight	200	60	28	1	+	+
School well	Dexter	10- 8-15	Bored	50	Tight	150	17	9	0	—	—
Springs	Dexfield	--------					1	1	0	—	—
City well (Wads residence)	Woodward	10-14-15	Drilled	-----	Good	500	2	2	0	—	—
Town well	Waukee	10-15-15	Bored	-----	Tight	50	5	7	1	+	+
School well	Waukee	10-15-15	Bored	-----	Loose	400	12	4	0	—	—
Town well	Waukee	10-15-15	Bored	-----	Loose	500	11	1	0	—	—
Hotel well	Waukee	10-15-15	Bored	-----	Loose	75	800	75	0	+	+

A few analyses of samples sent to the Iowa City laboratory were made at Mr. Jordan's request since complete equipment for chemical analyses was not available at Perry.

SAMPLES ANALYZED AT IOWA CITY LABORATORY.

(Chemical analyses in parts per million.)

Lab. No.	Town	Owner	Date received	Odor	Color	Turbidity	Sediment	Free ammonia	Alb. ammonia	No. 2	No. 3	Chlorine	Bact. pr. cc. lit. lact. ag. at 37°C.	Bact. pr. cc. nutr. ag. at 20°C.	A. C. 1 cc.	G. P. 1 cc.
1668	Woodward	Wm. Todd	9-30-15	Sl. veg.	Sl. gn.	No.	V. Sl.	.800	.020	.040	35.0	98	1	1,200	1	P.
1669	Woodward	G. F. Gusenger	9-30-15	Dec. veg.	Dec. gn.	V. sl.	Con. flo. straw	.010	.030	.000	32.0	18	190	1,500	----	P.
1670	Woodward	Jno. Porter	9-30-15	Sl. veg.	Sl. gn.	No.	Veg. sl.	.010	.020	.000	3.0	70	4	1,050	----	----
1671	Woodward	Al. Webster	9-30-15	V. sl.	Sl. gn.	No.	V. sl.	.014	.020	.001	8.0	30	40	600	----	P.
1692	Redfield	Granville Cave	10- 8-15	Dec. veg.	Sl. br.	V. sl.	Sl. flo.	.004	.014	.004	30.0	48	36	36,600	1	----
1693	Redfield	Pat Johnson	10- 8-15	Sl. mus.	Dec. gn.	Sl.	Con. org.	.030	.010	.008	25.0	56	80	10,000	1	P.
1694	Redfield	Chas. Mabbett	10- 8-15	Sl. earth	V. sl. gn.	V. sl.	V. sl.	.004	.010	.000	23.0	60	8	2,500	1	----
1695	Redfield	B. F. Raber	10- 8-15	Sl. veg.	Dec. gn.	Sl.	Sl. fe.	.014	.040	.008	18.0	81	32	2,400	10	P.
1730	Perry	Van Cleave	10-23-15	Sl. e.	V. sl. gn.	V. sl.	Sl. floc.	.008	.005	.010	28.0	90	3	720	----	P.
1731	Perry	S. A. Nelson	10-23-15	Sl. veg.	Sl. gn.	X	X	.002	.005	.000	10.0	56	4	5	----	P.

THE BURLINGTON SERIES OF SAMPLES.

At the request of Mr. Frank Lawlor, Superintendent of the Citizens Water Company of Burlington, 108 samples of the Burlington Water Supply have been examined. Mr. Lawlor desired to so treat the water supplied to the people of Burlington that the water would pass the Government's standard for water for Interstate Carriers. This is a very rigid standard for the supply of an entire city to meet. Liquid chlorine was depended upon as the means to reduce the bacteria in the effluent from the plant to the required figure. The bacterial count has usually been quite low, and the water has been of very good quality, although there have been found in it very resistent gas-forming bacteria. These seem to be spore-bearers.

BURLINGTON CHLORINATED FILTERED WATER (CHEMICAL ANALYSES IN PARTS PER MILLION)

Lab. number	Series number	Date, 1915	Lbs. Cl. per M. G.	Nitrites	Nitrates	Cl.	Bact. per c.c lit. lactose agar 37°C.	Bact. per c. c. nutrient agar at 20° C.	Acid colonies 1 c. c.	Gas in 1 c.c	Gas in 10 c. c. (times —	Gas in 10 c. c. (times P
1749	1	10-26	x	.004	1.5	5.0	70	210			x	x
1750	2	10-27	x	.001	2.0	3.0	2	27			x	x
1759	3	10-28	x	.002	1.0	4.0	1	40			x	x
1761	4	10-29	x	.000	1.0	4.0	38	55			x	x
1766	5	11- 1	x	.003	.5	4.0	1	23		p	x	x
1767	6	11- 1	x	trace	.5	4.0	1	3			x	x
1774	7	11- 2	x	.001	.2	4.4	1	12			x	x
1781	8	11- 3	x	.003	.2	4.0	4	5			x	x
1794	9	11- 4	x	.001	.2	3.0	1	4			2	1
1796	10	11- 5	x	.001	1.0	3.	13	13			2	1
1802	11	11- 8	x	.003	.2	x	1	28			2	1
9	12	11- 9	x	.001	.2	4.0	1	10			2	1
13	13	11-10	x	.001	.2	x	7	300			2	1
23	14	11-11	x	.000	.2	4.0	0	2			2	1
26	15	11-12	x	.001	.2	4.0	1	6			2	1
36	16	11-15	x	.000	.2	3.6	0	3			2	1
40	17	11-16	x	.000	.2	3.0	0	1			2	1
42	18	11-17	x	.000	.2	3.0	1	2			2	0
44	19	11-18	x	.000	.2	3.0	1	1			2	1
49	20	11-19	x	.000	.2	3.0	3	5			2	1
55	21	11-22	x	.000	.2	3.0	3	1			2	0
57	22	11-23	x	.000	.2	3.0	2	8			2	0
62	23	11-26	x	.001	.2	3.0	1	9			2	0
68	24	11-27	x	.000	.2	3.0	1	6			1	1
74	25	11-29	x	.000	x	3.0	1	2			2	0
80	26	12- 1	x	x	.2	3.0	4	6			2	0
92	27	12- 6	x	.002	.2	3.0	0	4			2	0
96	28	12- 7	x	.002	.2	3.0	1	3			2	0
98	29	12- 8	x	.003	.2	3.0	2	5			2	0
1902	30	12- 9	x	.002	.2	3.0	1	23			2	0
7	31	12-10	x	.001	.2	3.0	2	8			2	0
15	32	12-13	x	.000	.2	3.0	0	8			4	0
18	33	12-14	x	.001	1.0	3.0	0	2			2	0
29	34	12-15	x	.000	1.0	3.5	1	1			2	0
32	35	12-16	x	.001	.75	3.5	4	1			5	0
37	36	12-17	x	.001	1.0	3.5	Lost	0			2	0
43	37	12-20	x	.001	.75	3.0	5	5	1		1	1
49	38	12-21	x	.001	.75	3.0	6	3	1		2	0
69	39	12-27	x	.000	.75	4.5	1	2			4	1
71	40	12-28	x	.001	.75	4.0	0	5			5	0
81	41	12-29	x	.000	.75	3.5	0	7			3	0
		1916										
85	42	1- 4	x	.000	.75	3.5	3	2			5	0

BURLINGTON CHLORINATED FILTERED WATER—Continued.

Lab. number	Series number	Date, 1915	Lbs. Cl. per M. G.	Nitrites	Nitrates	Cl.	Bact. per cc. lit. lactose agar 37°C.	Bact. per c. c. nutrient agar at 20° C.	Acid colonies 1 c. c.	Gas in 1 c. c.	Gas in 10 c. c. (times —	Gas in 10 c. c. (times P
92	43	1- 5	x	.000	.75	3.5	0	7			5	0
97	44	1- 6	x	.000	.5	4.5	3	4			5	0
99	45	1- 7	x	.000	.5	3.5	3	65			5	0
2007	46	1-10	x	.000	.75	4.0	4	3			3	2
10	47	1-10	x	.000	.75	3.5	26	13			0	3
27	48	1-19	x	.000	x	x	10	7			3	2
39	49	1-24	x	.002	.5	3.5	3	4			2	3
48	50	1-26	x	.000	.5	3.5	12	10	2	p	0	4
51	51	1-28	x	x	x	x	6	0			2	3
59	52	1-31	x	.000	.75	4.0	0	0			2	2
64	53	2- 2	x	.002	2.0	5.0	11	5		p	0	5
70	54	2- 4	4.28	x	x	5.0	5	7			1	4
79	55	2- 7	5.05	.003	.5	4.5	6	13			1	4
83	56	2- 9	4.19	.000	.5	4.0	5	13			0	5
2089	57	2-11	x	.000	.5	4.0	3	10			1	4
2098	58	2-14	4.16	.001	.5	3.5	2	8			4	1
2104	59	2-16	4.68	.000	.5	5.0	1	6			5	0
2111	60	2-18	4.43	.001	.5	3.5	2	3			4	1
2119	61	2-21	5.27	.000	.5	4.0	2	3			3	2
2130	62	2-23	5.34	.001	1.0	4.0	2	5			5	0
2135	63	2-25	5.47	x	.75	4.0	2	3			1	4
2142	64	2-28	5.01	.000	1.0	4.0	1	475			3	2
2147	65	3- 1	5.89	.000	1.0	4.0	2	7			2	3
2156	66	3- 3	5.45	.000	1.0	3.5	3	7			3	2
2164	67	3- 6	5.95	.000	1.0	5.0	5	180	1		2	3
2172	68	3- 8	5.44	.000	1.0	4.5	1	82			4	1
2176	69	3-10	4.79	.000	1.0	4.5	2	2			1	4
2185	70	3-13	5.00	.000	1.0	5.0	1	3			4	1
2192	71	3-15	5.06	.000	1.0	4.5	0	120			5	0
2195	72	3-17	5.75	.000	4.0	4.0	0	3			5	0
2203	73	3-20	x	.000	1.0	3.5	1	3			5	0
2209	74	3-22	4.90	.001	1.0	4.5	1	4			5	0
2219	75	3.24	4.75	.001	.75	4.5	1	7			5	0
2227	76	3-27	4.54	.000	.5	4.0	0	7			5	0
2238	77	3-29	4.09	.000	.75	4.0	4	12			5	0
2246	78	3-31	4.08	.000	2.0	x	1	3			2	3
2256	79	4- 3	4.16	.001	1.5	5.0	0	3			5	0
2263	80	4- 5	3.88	.001	2.0	3.5	2	5			5	0
2268	81	4- 7	5.05	.000	2.0	4.5	0	7			5	0
2281	82	4-10	4.75	.001	2.0	4.0	0	1			5	0
2300	83	4-14	4.27	.000	1.5	3.5	0	4			5	0
2322	84	4-18	5.06	.000	2.0	2.5	0	1			5	0
2332	85	4-20	4.18	.000	1.5	3.0	2	9			5	0
2339	86	4-24	1.73	trace	1.0	3.0	4	4			5	0
2365	87	4-26	3.70	.000	1.0	2.0	2	8			4	1
2373	88	4-28	4.29	x	x	x	19	26			3	2
2382	89	5- 1	4.65	.000	2.0	3.0	17	21		p	0	5
2390	90	5- 3	5.19	x	x	x	4	12			2	3
2405	91	5- 8	4.44	x	x	x	10	26			4	1
2416	92	5-10	4.07	x	x	x	8	18			5	0
2423	93	5-12	4.38	x	x	x	10	38			4	1
2433	94	5-16	4.03	x	x	x	5	35			5	0
2439	95	5-17	4.63	x	x	x	3	6			5	0
2443	96	5-19	4.17	x	x	x	6	16			4	1
2454	97	5-23	4.05	x	x	x	1	18			5	0
2462	98	5-25	4.71	x	x	x	0	600			1	4
2480	90	5-30	4.10	x	x	x	0	9			5	0
2495	100	6- 1	4.14	x	x	x	0	150			5	0
2510	101	6- 6	4.99	x	x	x	1	3	1		5	*0
2516	102	6- 8	4.34	x	x	x	1	8			5	0
2530	103	6-13	3.91	x	x	x	10	4	1		5	†0
2537	104	6-15	x	x	x	x	800	45			1	4
2550	105	6-20	4.76	x	x	x	5	6			3	2
2557	106	6-22	3.49	x	x	x	1	55			2	3
2581	107	6-27	4.71	x	x	x	9	5			3	2
2586	108	6-29	4.74	x	x	x	400	900			3	2

*Acid colony seems to be yeast. †Not B. coli.
‡Acid plate.

The above table is a very interesting one. From sample No. 2070 on, the amount of liquid chlorine added per million gallons is given. The bacterial efficiency of any given amount of chlorine is, of course, dependent to a large degree on the amount of oxidizable organic matter in the water. That a given amount of chlorine per million gallons may produce a less satisfactory purification on some days than on others is strikingly shown. This lack of uniform action must be expected where rapidly varying river water is treated.

The samples were taken daily when the apparatus was first installed, afterwards but two or three samples a week were submitted. During the latter part of the series, the determination of nitrites, nitrates and chlorine were omitted because they did not yield any information of value. The chlorine added to the water would not increase the chlorine content much over one-half part per million.

Waterworks operators—especially in those plants which do not maintain laboratories of their own—would do well to follow the example of Mr. Lawlor in controlling the water supplied to their customers. Every water-works could have a weekly examination made at comparatively small expense. The investment would be well worth while; more satisfactory water would be supplied, the satisfaction of the users of the water would be greater and there would not be the continued suspicion which unfortunately is thrown upon the output of many plants—often quite justly.

OAKDALE.

At the request of Mr. Lafayette Higgins, C. E., sanitary engineer of the State Board of Health, a weekly examination has been made for the State Board of Control of the sewage and sewage-plant effluent of the Oakdale Sanitarium. During the winter, as is usual, the operation of the plant was less efficient than during warmer weather. Although a good improvement was effected before repairing the plant, the removal of clay which had washed onto the surface of the filters and the levelling of the filter bed, rendered the purification much more satisfactory. Except during the time the filters were out of commission three samples were collected on Monday of each week. A few samples at the mouth of the brook into which the effluent is discharged were taken at its juncture with the Iowa river. A tabulation of results is given below:

OAKDALE SEWAGE EFFLUENTS.

Lab. No.	Date	Nitrogen as: Free NH3	Nitrogen as: Alb. NH3	Nitrogen as: No. 2	Nitrogen as: No. 3	Cl.	Oxygen consumed	Stability	Bacteria per c.c.: At 37°	Bacteria per c.c.: At 20°	Bacteria per c.c.: Acid formers	Bacteria per c.c.: Gas formers in .0001c.c.
1991	1- 6	4.000	.500	.018	1.75	30.0	23.2	99%	32,000	50,000	*	p
2063	1-10	10.500	.750	.02	.75	38.0	14.7	99%	7,700	45,000	70	p
2021	1-17	15.750	2.875	.004	.20	48.0	28.8	11%	52,000	430,000	3,000	p
2067	1-24	15.250	1.500	.010	.50	32.0	23.9	11%	70,000	2,500,000	4,000	p
2066	1-31	11.000	1.500	.015	.20	37.0	31.9	15%	30,000	190,000	*	p
2084	2-14	18.500	1.620	.000	.00	40.0	26.5	39%	40,000	6,000,000	20,000	p
2117	2-21	17.000	1.000	.020	.75	37.0	12.0	21%	17,000	2,200,000	5,000	p
2140	2-28	20.000	1.250	.015	1.00	36.0	16.0	75%	18,000	5,700,000	4,000	p
2161	3- 6	28.000	1.000	.020	1.00	33.0	10.5	99%	6,500	210,000	1,000	p
2181	3-13	26.000	2.000	.055	6.00	26.0	13.5	99%	90,000	5,300,000	10,000	p
2200	3-20	17.500	.150	.200	20.00	30.0	10.0	99%	29,000	5,400,000	*	p
2224	3-27	28.500	1.500	lost	15.00	13.0	1.0	99%	1,000	150,000	400	p
2251	4- 3	14.500	1.500	.200	30.00	26.5	10.0	99%	16,200	3,000,000	*	p
2274	5-19	7.25	1.500	.200	35.00	32.0	8.5	99%	3,400	1,070,000	1,500	p
2468	5-28	27.50	2.50	.035	25.00	26.0	11.5	99%	170,000	700,000	----	p
2524	6-12	.250	.250	.030	30.00	5.0	5.0	99+%	140,000	2,000,000	30,000	p
2544	6-19	.250	.500	.060	50.00	16.0	16.0	99+%	30,000	4,600,000	----	p

6-26-16.
Samples analyzed—Raw sewerage..... 23
Siphon chamber 26
Effluent filter beds..... 4
Creek at mouth..... 12
Total 65

*Means strong acid production.

IOWA CITY.

For over a year and a half, the laboratory has been making daily examinations of the water supplied to the people of Iowa City by the Iowa City Water company. The work was done for the University at the request of President MacBride and was intended to safeguard the health of the students of the University. Whenever there was reason to do so, warning notices were posted on the bulletin boards of the University and inserted in the local papers advising the use of the city water only after boiling. Sometimes the city water has shown very great variation in quality from day to day. It reached its worst condition January 20, 1915. On that day, the treated water showed a total bacterial count of 36,000 per c. c.

At the time above mentioned the Water Company was attempting to run its plant entirely without chemical or bacteriological control of its purification process. No better proof of the lack of wisdom of such a procedure than our record of the extremely eratic performance of the plant could be had. To be sure there was fortunately no epidemic, but there was ample opportunity had the river water been infected with the specific organisms of typhoid fever at that time. In March, 1916, the company made arrangements to secure for its supply supervision of the chemical and bacteriological condition of the water. In the future there should be much more uniform operating results. A report of the examinations made since from September 21, 1915, is given in the special article appended hereto. From September 21, 1915, to June 30, 1916, the results on the treated water are set forth in the following table:

IOWA CITY WATER EXAMINED.

Treated Water Since September 21, 1915:

Total number samples	283
Total number satisfactory	251
Total number unsatisfactory	32
Total number since controlled by lab. tests	74
Total number satisfactory	70
Total number unsatisfactory	4

WAVERLY INVESTIGATION.

At the time of Dr. Mark F. Boyd's epidemiological investigation at Waverly, April 5-7, 1916, it was found that an overflow connection from the pump-well or reservoir had allowed contamination of the city water by back-flow from the river at times of high water. At Dr. Boyd's suggestion this over-flow pipe was shut off and the well water treated with hypochlorite by means of an improvised plant.

The sides of the pump-well were of stone in apparent bad condition. It was believed that the river water might be seeping into the well pit. A series of examinations of the water were made after closing the overflow pipe to determine whether or not any seepage was taking place. Each set of samples included a sample from the river, one from the pump-well, and one from the water after chlorination. The results of our ingestigation did not indicate that seepage was entering the well.

WAVERLY WATER SAMPLES.

(Chemical analysis in parts per million)

Lab. No. 2306	Date received 1916	Source	Alkalinity	Nitrites	Nitrates	Chlorine	Bact. per cc. Litmus lactose agar at 37°C.	Bact. per cc. nutrient agar at 20°C.	Acid forming colonies	Gas formers in 1 cc.
2306	4-18	Treated well water	254			3.0	1	1,700	—	p.
2307	4-18	River	167			4.0	90	2,800	Acid pl.	p.
2308	4-18	Well, 1900	256			2.5	0	3	0	a.
2324	4-20	River	166			6.0	600	2,400		p.
2325	4-20	Well	257			4.5	1	4		
2326	4-20	Treated water	253			4.5	1	1,800		
2350	4-26	Treated water	258	3.0		4.5	1	1		p.
2351	4-26	River	118	1.0		1.5	700	1,300		
2352	4-26	Well	260	0.0		4.0	3	3		
2377	5- 2	Treated water	252	2.0		6.0	2	6		p.
2378	5- 2	River	149	4.0		2.0	250	2,300		p.
2379	5- 2	Well	264	1.0		4.0	0	4		
2400	5- 9	Treated	256	0.0		4.0	1 (sp)	1		
2401	5- 9	Well	256	0.0		4.0	0	15		
2402	5- 9	River	175	2.0		2.0	70	700		p.
2430	5-16	Treated	262	.5		3.5	2	1		p.
2431	5-16	River	165	1.5		1.5	840	3,500		p.
2432	5-16	Well	251	.5		4.0	5 (sp)	35		p.
2451	5-24	River	151	1.0		1.0	90	1,400	29	p.
2452	5-24	Well	257	.004		4.5	1	13		
2453	5-24	Treated	259	.5		4.0	0	0		
2477	5-31	Treated	261	.006		3.5	1	1		
2478	5-31	Well	262	.004	0.0	4.0	0	17		
2479	5-31	River	182	.004	5.0	3.0	20 (sp)	1,200		p.
2507	6- 7	River	120	.006	4.0	4.0	180	1,900		p.
2508	6- 7	Well	258	.008	.2	5.0	Spreader	0		
2569	6- 7	Treated	256	.008	.2	5.0	2 (sp)	21		
2572	6-27	River	163	.015	1.0	5.0	90	300	1	p.
2573	6-27	Reservoir	260	.012	.2	4.5	11	110		
2574	6-27	Treated	264	.018	.2	4.5	0	13		p.

DESCRIPTION OF THE WORK.

The object of the examinations undertaken by the Water Laboratory has been broadly given in a preceding section of this report. More narrowly the object may be stated as the determination in a water of the presence or absence of fresh sewage like material. We attempt to determine this because sewage is likely to contain the specific organisms of typhoid fever and other diseases. When examining sewage itself we are interested in determining the likelihood of the effluent to create a nuisance either by its offensive putrefaction or by its injurious effect upon fish life or upon the operation of water purification plants below the outfall on the stream.

Water samples—and to a lesser extent, sewage samples—are much affected by the vessel in which they are collected. If the bottle contains a germicidal substance, the bacterial flora will be reduced; if it contains bacterial food or bacteria-laden matter, the bacterial flora will be tremendously augmented; and if it contains even traces of foreign matter, the chemical findings may be altered. Moreover chemical and bacteriological changes take place with varying rapidity even in perfectly clean, sterile bottles. The manner of collection and the promptness of shipment, therefore become matters of importance.

It is important in forming an opinion upon a water supply of any sort, that we have all pertinent data regarding it which may be available. Our instructions for the collection and shipping of samples are printed on the data blank. This is sent in the tag envelope tied to the container. It is as follows:

THE STATE UNIVERSITY OF IOWA.

LABORATORIES FOR THE STATE BOARD OF HEALTH.

Iowa City, Iowa.

WATER FOR ANALYSIS—INSTRUCTIONS.

(Read Carefully and Comply with the requirements in every particular.)

1st. *From a Water Tap.*—The water should run freely from the tap for a few minutes before it is collected. The bottle is then to be placed directly under the tap and rinsed out with water at least twice, pouring out the water completely each time. It is then again to be placed under the tap and filled to overflowing, and then a small quantity poured out, so that there shall be left an air space of about an inch under the stopper. The stopper must be rinsed off with flowing water from the tap and inserted into the bottle while still wet, and secured by tying over it a clean piece of cotton cloth. The ends of string must be sealed on the top of the stopper. *Under no circumstances should the inside of the neck of the bottle or the stem of the stopper be wiped with a cloth or touched by the hand or any other object.*

2d. *From a Stream, Pond or Reservoir.*—The bottle and stopper should be rinsed with water, if this can be done *without stirring up the sediment on the bottom.* The bottle, with the stopper in place, should then be entirely submerged in the water and the stopper taken out at a distance of about twelve inches below the surface. When the bottle is full, the stopper is replaced below the surface, if possible, and finally secured as above. It will be found convenient in taking samples in this way to have the bottle weighted, so that it will sink below the surface. It is important that the sample should be obtained free from

sediment on the bottom of the stream and from the scum on the surface. If the stream should not be deep enough to admit of this method of taking a sample, the water must be dipped up with an *absolutely clean* vessel and poured into the bottle after it has been rinsed.

3d. *From a Well.*—Pump or draw the water until the water in the pump stock is replaced by fresh water, rinse the bottle and stopper, then fill, *using all the precautions above mentioned*, and seal as directed.

The sample of water should be collected immediately before shipping by express, so that as little time as possible shall intervene between the collection of the sample and its examination.

NOTE: In order to interpret correctly the results of an analysis of a given sample of water it is necessary to take into account all the factors and conditions that may possibly impair its purity or in any manner affect its quality; therefore we desire that the following blank shall be filled out as accurately and as completely as possible and enclosed in the envelope tag used in shipping the sample to the Laboratory. *No examination will be made unless these requirements are complied with.*

SAMPLE OF WATER.

City or Town.....County.....
Collected and sealed by.....
Name
Name and address of owner of supply from which sample was taken:
.....
.....
Report results to:
Name .....
Address .....
Collected from .....
State whether the water is from a stream, pond, reservoir,
Spring, dug well, driven well, or
.....
other source
Depth of well..... Distance to surface of water.....
Nature and condition of casing.....
Can surface drainage and small animals readily enter well?.....
Is sample from public or private supply?.....
Collected on .....
Give day, date, and hour of day

If sample is from a well, spring or stream near or about buildings, give particulars as follows:
Distance from privy.....
Distance from sink drain.....
Distance from cesspool.....
Distance from barnyards, etc.....
Is the drainage slope from any of the above named towards the well or spring?
.....

If away from buildings, is the source from which sample was taken surrounded by or near to a field of grass, or ploughed lands, manured lands, in the woods, etc.? Give particulars fully.....
.....
.....
Kind of soil, sub-soil and underlying strata.....
.....
Is the depth and character of water affected by heavy rains?.....
.....
Have there been recent heavy rains?.....
Is the water unusually low?.....

Does water flow through lead, iron, or galvanized iron pipe? If so, state which, and give diameter and length of pipe and state whether flow is continuous or not.
.....
.....
.....
Why do you think the water is bad?.....
.....
.....
.....
.....
.....
.....
Is the water now suspected as a cause of illness? If so, state particulars.
.....
.....
.....
Is this the only water used by persons affected?.....

NOTE.

When samples are shipped in special containers for sending iced samples, observe following precautions:

Collect sample with great care. Keep cap and cover clean. Return bottle immediately to metal can, stand upright and pack at once in ice and excelsior. Use sufficient packing.

The bottle must not fall over when the ice melts.

(The above does not apply when samples are shipped in 1 gallon containers.)

NOTE All express charges for the transportation of a sample of water to the Laboratory must be PAID BY THE SENDER.

NOTE: NO WATER SHOULD REACH LABORATORY LATER IN THE WEEK THAN FRIDAY, otherwise it might have to remain in the Laboratory over Sunday, and therefore would not be fresh for analysis, as is necessary to arrive at correct results.

TO BE FILLED OUT AT LABORATORY.

No.....
Sample received .....
Reported .....
Cash enclosure .....
Form .....

NOTE: Do not ship sample of water later in the week than Wednesday. No report will be made until the fee is received.

From time to time we receive miscellaneous samples of water sent in various sorts of bottles and jugs. We do not make exemination of these, since they are nearly always highly contaminated and the results would be of no value. The fee which we would have to charge would be wasted and incorrect conclusions might be given wide publicity. Undue suspicion might be thrown upon some plant or well. Those persons who do submit samples of this sort are invited to send another sample, collected in one of our containers, for examinations.

Results on samples sent in miscellaneous bottles: Good, 3; Doubtful, 6; Bad, 35; Total, 44.

In brief, our reasons for rejecting these bottles are as follows: Corks, corn-cobs and rolled paper when used as stoppers yield bacteria and extractive matters; dirty bottles yield various substances and bacteria; jugs may yield chlorine from the salt-glazing and even new jugs may

yield large numbers of bacteria from the bits of straw and other foreign matter lodged upon their rough interior. A more complete exposition of the importance of clean and sterile bottles and proper precautions in collection will be found in the article "Methods of Sending Samples of Water" which is appended hereto.

Our containers are of two sorts. We have containers to hold one-gallon glass-stoppered bottles. The shipping case is simply a felt-lined box. The other type container is designed for packing the water samples in ice. It consists of a wooden box lined with galvanized iron. The newer ones are insulated by a 3-8" layer of felt between the galvanized iron and the wood. A cylindrical metal case contains the bottle which is thus protected from the ice and the water resulting from the melting of it. A light packing of excelsior is added to prevent the cylindrical case from falling over. The bottle is a 500 c. c. glass-toppered wide-mouth bottle. Eight to ten pounds of ice are required for icing these containers.

The bottles are cleansed by rinsing with a strongly acid mixture of potassium decleromate and sulphuric acid. They are then carefully rinsed several times to remove the last traces of the cleaner. The large bottles are then sterilized by steam streaming from a tap under 90 pounds pressure, while the smaller are sterilized by dry heat in a large hot-air sterilizer. The tops of the bottles are protected against dust and contaminating material by muslin covers which are tied in place by cord. The ends of the cord are sealed on the top of the bottle by an official wax seal to show that the bottle has not been tampered with and is therefore sterile. A small square of sterile foil is placed between the top of the smaller bottles and the cloth cover.

When a sample is received at the laboratory, its examination is begun at once. The report of the examination, should reach the sender of sample in from a week to ten days thereafter. The determinations usually made are as follows:

1. Number of bacteria per cubic centimeter on litmus lactose agar for 24 hours at 37° C.
2. Number of bacteria per cubic centimeter on nutrient agar for 48 hours at 20° C.
3. Acid forming bacteria on litmus lactose agar at 37° C.
4. Gas forming bacteria in lactose broth in 24 and 48 hours at 37° C.
5. Physical examination—odor.
6. Physical examination—color.
7. Physical examination—turbidity.
8. Physical examination—sediment and larger microscopic organisms.
9. Determination of nitrogen as free ammonia (in parts per million).
10. Determination of nitrogen as albuminoid ammonia (in p. p. m.).
11. Determination of nitrogen as nitrites (in p. p. m.).
12. Determination of nitrogen as nitrates (in p. p. m.).
13. Determination of chlorine (in p. p. m.).

Some other determinations are occasionally made. These are the determinations of iron, alkalinity, confirmatory tests for the colon bacillus, etc. The oxygen consumed test, stability tests, etc., are applied to sewage.

When the analysis has been made the results are copied from the day sheet onto the permanent filing card.

Water Analysis	Lab. No.	County
From (City or Town) *Collected and sealed by* *Address* *Report sent to* *Address* *Source* *Collected on* *Opinion given*		*Bacterial Examination* *Date Planted* *Date Counted* *Bacteria per cubic centimeter* *at 37° C.* | *at 20° C.* *L. L.* | *N. A.* *B. Coli* *Acid colonies per c. c.* *Gas in c. c.*
Number Analyses	*Sample Old*	*Non Uniform Bottle* — *Remarks*
Look up Reports	*Public*	*Private* — *Examined by*

The cards are then filed under county, by city under county and by laboratory number under the city. We file by county in order that we may have immediately available for comparison several analyses from the same district, even though we have not before analyzed water from the particular town or city as the sample on which the report is being prepared.

From the filing card a report form is made out in triplicate in typewriting. These are carefully checked in the laboratory and a report is written carefully explaining the meaning of the results obtained. The report form is shown below:

THE STATE UNIVERSITY OF IOWA—LABORATORIES FOR THE STATE BOARD OF HEALTH, IOWA CITY, IOWA.
SANITARY WATER ANALYSIS.
Parts in 1,000,000.

Laboratory No. ..... 19....
From .....
Source of Sample .....
Odor ..... Color .....
Turbidity ..... Sediment .....
Nitrogen as Free Ammonia ..... Nitrogen as Albuminoid Ammonia .....
Nitrogen as Nitrites ..... Nitrogen as Nitrates .....
Chlorine ..... Oxygen Consumed .....
Total Solids ..... Fixed Solids .....
Hardness ..... Iron .....
Microscopic Examination .....
Bacteria per c. c. at 37° C. .....
Bacteria per c. c. at 20° C. .....
Colon Bacilli .....
Remarks:
.....

The explanatory letter and one of these reports is sent to the person who had the examination made, a second is sent to the mayor of the community for filing among the records of the local board of health, while the third is filed in the office under the name of the sender of the sample.

We are careful to explain clearly what the condition of the water is, on the basis of our examination of the sample. We realize that it is often unwise to be guided by a single analyses, therefore when there seems to be doubt we advise the collection of a duplicate specimen. We explain our numerical findings and their meaning as clearly as possible, because we know that the figures mean very little to the average person. It would be easier in many cases (though less scientific) to explain the condition of a water by means of a fixed standard. We would, however, be obliged to cite so many exceptions that the standard would in the end serve to make the matter more confusing. The proper interpretation of results is even when all available data are at hand, the sanitary survey is known and the analytical data obtained, a matter requiring a considerable amount of skill and experience.

SUMMARY.

The tables of this section summarize the work of the year quite generally. The table on Page 192 gives the classification of samples by ownership, source, and results of analysis. In order that some knowledge may be had of the towns that are observing the rule requiring periodical examination of public water supplies, the table on pages 190-192 has been drawn up. This is a list of towns from which public samples have been received. A few samples of the twenty-three regarding which we were furnished no data were probably public samples.

The funds which were collected in accordance with the act of the 36th General Assembly, mention of which is made above were transmitted through the Secretary of the University to the Treasurer of the State. The amount on hand or in the bank June 30, 1916, was $69.90 and the total transmitted was $762.26.

LIST OF CITIES AND TOWNS HAVING WATER OR SEWAGE EXAMINATIONS MADE OF SAMPLES FROM PUBLIC SOURCES.

From July 1, 1915 to June 31, 1916 (incl.)

Adair County	Greenfield
Adair County	Adair
Appanoose County	Centerville
Benton County	Belle Plaine
Benton County	Vinton
Blackhawk County	Cedar Falls
Blackhawk County	La Porte City
Blackhawk County	Waterloo
Bremer County	Sumner
Bremer County	Readlyn
Bremer County	Waverly
Buena Vista County	Alta
Buena Vista County	Storm Lake
Calhoun County	Jolly
Calhoun County	Lake City
Cass County	Atlantic
Cedar County	Stanwood
Cerro Gordo County	Mason City
Cherokee County	Cherokee
Cherokee County	Marcus
Clarke County	Woodburn
Clinton County	Clinton
Crawford County	Denison
Crawford County	Kiron
Crawford County	Vail
Crawford County	West Side
Dallas County	Dallas Center
Decatur County	Lamoni
Des Moines County	Burlington
Dickinson County	Milford
Dickinson County	Spirit Lake
Dickinson County	Terrill
Dubuque County	Dubuque
Dubuque County	Farley
Fayette County	Oelwein
Fayette County	West Union
Floyd County	Charles City
Floyd County	Floyd
Floyd County	Marble Rock
Fremont County	Hamburg
Grundy County	Grundy Center
Hancock County	Garner

Hardin County	Eldora
Hardin County	Radcliffe
Howard County	Lime Springs
Humboldt County	Bode
Ida County	Holstein
Iowa County	Amana
Iowa County	Marengo
Jackson County	Bellevue
Jackson County	Maquoketa
Jasper County	Kellogg
Jasper County	Newton
Jasper County	Prairie City
Jefferson County	Fairfield
Johnson County	Coralville
Johnson County	Iowa City
Johnson County	Oakdale
Keokuk County	Hedrick
Keokuk County	Keota
Keokuk County	Sigourney
Kossuth County	Ledyard
Lee County	Keokuk
Linn County	Cedar Rapids
Linn County	Center Point
Linn County	Marion
Louisa County	Morning Sun
Madison County	Winterset
Marion County	Knoxville
Marion County	Pella
Marshall County	Liscombe
Marshall County	Marshalltown
Mills County	Malvern
Mitchell County	Riceville
Mitchell County	St. Ansgar
Monona County	Mapleton
Monona County	Onawa
Montgomery County	Villisca
Muscatine County	Muscatine
Muscatine County	West Liberty
O'Brien County	Sanborn
O'Brien County	Primghar
Osceola County	Ocheyedan
Page County	Clarinda
Page County	Shanandoah
Plymouth County	Akron
Pocahontas County	Rolfe
Pocahontas County	Ware
Pottawattamie County	Avoca
Pottawattamie County	Council Bluffs
Poweshiek County	Grinnell

Ringgold County	Tingley
Shelby County	Defiance
Shelby County	Harlan
Sioux County	Hull
Sioux County	Boyden
Sioux County	Granville
Story County	Colo
Tama County	Tama
Tama County	Gladbrook
Tama County	Toledo
Union County	Creston
Van Buren County	Farmington
Wapello County	Eldora
Washington County	Ainsworth
Washington County	Crawfordsville
Washington County	Washington
Wayne County	Corydon
Webster County	Duncombe
Webster County	Ft. Dodge
Winneshiek County	Decorah
Wright County	Eagle Grove

GENERAL SUMMARY WORK OF WATER LABORATORY

Public	Good	Bad	Doubtful	Total
Shallow wells	56	24	20	100
Deep wells	76	11	10	97
Springs	0	1	0	1
Treated	448	53	18	519
Raw streams, lakes, etc.	56	51	7	114
Miscellaneous	3	2	0	5
Sewage	0	67	0	67
Total public				903
Ownership Not Stated—				
Shallow wells	67	109	39	215
Deep wells	27	6	6	39
Springs	3	3	1	7
Streams, etc.	0	3	1	4
Ice	12	2	4	18
Cisterns	5	4	0	9
Miscellaneous	1	2	0	3
Total private				295
Private—				
Shallow wells	0	6	0	6
Deep wells	2	1	0	3
Springs	1	0	1	2
Cisterns	0	1	0	1
Miscellaneous	0	1	0	1
Total ownership not stated				13
No data	2	5	3	13
Grand total	759	352	110	1,221

Samples received from 83 counties.
Samples received from 197 cities and towns.
Samples received from public sources of 112 cities and towns.

WORK OF THE DIVISION OF EPIDEMIOLOGY.

From the time of the organization of the laboratory until 1915 several isolated epidemiological investigations had been made from time to time by different members of the laboratory staff. These were chiefly investigations of typhoid outbreaks, among which were those at Waterloo, Fairfield, Oskaloosa, Fort Dodge, etc. The 36th General Assembly in 1915 incorporated as an integral part of this laboratory, the Epidemiological laboratory which has been established at the University as an independent service by the 35th General Assembly. Special provision for this class of public health work at this laboratory therefore dates from the middle of the present biennium.

Since people frequently do not clearly comprehend what is meant by epidemiology and an epidemiological investigation, it may be well to preface this report by an explanation. Epidemiology as a field of science is rather new, and owes its development to the definite etiological knowledge of communicable diseases that have accumulated in the last twenty to thirty years as a result of bacteriological and protozoölogical studies. It is concerned with the sources of the specific infective organisms of these diseases and the routes by which they are transmitted from person to person or animal to animal, etc. Practically, its value lies in the application of this knowledge to the prevention or prophylaxis and control of these diseases, which if properly performed, is very effective. Epidemiologists generally recognize two principal ways in which this knowledge is applied, namely routine and emergency epidemiology. Routine epidemiology consists in the careful supervision and control of each case of communicable disease as it arises, regardless of the number of cases of a disease, the ascertainment if possible, of the course from which infection was received, and the institution of proper measures to prevent the further spread of infection from the case. By it, the spread of a communicable disease in a community may be checked so that the only cases which occur will be those receiving infection from outside sources. Emergency epidemiology, on the other hand, consists in the application of these measures after an epidemic has made its appearance, after the maximum damage has been done. It is an exhibition of the well known and time worn policy of locking the barn after the horse is stolen. Therefore routine epidemiology is the aim towards which we must aspire if effective work in disease prevention is to be done.

It has been conclusively demonstrated by bacteriologists that each case of an infectious disease owes its origin to infection received from some pre-existing infected individual, either a person ill with the same disease or a "carrier", from whom, by a variety of possible routes, infection was received. The routes by which infective micro-organisms are transferred from the infected to the susceptible are quite diverse, and

vary in importance with different diseases. The most important, which with many diseases is the sole route of transfer, is known as infection from contact, and consists in the direct transfer of infection from person to person, by any one of the multitude of ways, of which the common drinking cup and town are well known examples. The fingers are the principal means by which micro-organisms are introduced into the mouth and are therefore chief means of contact infection. Diphtheria, scarlet fever, syphilis and tuberculosis are chiefly spread in this manner. The organisms of other diseases, such as typhoid, may be transferred by drinking water, milk and various foods. Some few, which fortunately do not concern us in Iowa, are only transferred by blood sucking insects from person to person. The organisms of nearly all diseases, save those transmitted solely by biting insects, leave the body or are present in the various secretion and excretions of the infected person, saliva, sweat, milk, feces, urine, pus, discharges from ulcers, etc., and from these they may reach any of the routes of infection we have already mentioned. Fortunately the majority of the micro-organisms causing these diseases are incapable of extended growth and multiplication outside the human or animal body, but become attentuated and die after varying intervals of time, as a result of their great delicacy and the unfavorable conditions they encounter. This circumstance is of exceedingly great value to us, since it causes the destruction of the majority of pathogenic germs which leave the body of infected persons. The mouth and nose are the chief gateways through which the organisms of the most common diseases infect a susceptible person, though some can penetrate apparently uninjured skin, while others can only be introduced through wounds or abrasions of the skin. The epidemiologist must ascertain these particulars for all cases of communicable diseases he is engaged in combatting, varying his inquiries of course according to the nature of the disease concerned.

Because he is interested in the prevalence of the disease in a community as a whole, rather than the manifestation of the disease in individual patients, his viewpoint is materially different from that of the practicing physician. Furthermore, the methods prescribed by the epidemiologist for the cure of the community are not comparable to the methods presented by the physician for the cure of his patient. After the diagnosis of the patient's illness is established and the epidemiologist has secured the necessary data concerning the possible routes of infection encountered by the patient, his only further interest in the case is to make certain that no opportunities exist for the further spread of infection from that individual.

It is impossible, however, to undertake routine epidemiological work unless the epidemiologist has immediate knowledge of when or where communicable diseases are occurring. Unfortunately, in our state satisfactory means of obtaining this information do not exist. As a fundamental measure, before really effective routine epidemiological work can be done, we must have a morbidity report law, which will require all physicians to immediately report in writing to the local Board of Health every case of communicable disease seen by them, or if no physician is in attendance, to require the reporting by the head of the household in which the patient lives. Furthermore, the local Board of Health must transmit weekly to the proper state authorities the reports which they have received. Only by the action of such a law can the state follow the prevalence of preventable diseases within its borders and only by closely following such intelligence can the state hope to efficiently assist local authorities in controling difficult situations arising from disease outbreaks. To a certain extent information is at present afforded the Secretary of the Board by the returns from the local boards giving the number of quarantines which have been established. But this law gives imperfect and unsatisfactory information since our present quarantine law covers only a few diseases, and such important and serious diseases as tuberculosis and typhoid are entirely ignored. From all information available it is apparent the reports of quarantine received represent only a fraction of the total cases of these diseases occurring. The only conclusion we can reach therefore, is that the official sources of epidemiological information available in Iowa at present are incomplete, inaccurate and of little value for satisfactory epidemiolgical work.

Lacking definite official reports of the prevalence of communicable diseases over the state the epidemiological division has had to utilize every possible source of information at hand in order to keep even incompletely posted. The results of the examination made in the diagnostic division of this laboratory have furnished us our most constant and reliable information, but unfortunately the information available from this source only relates to diphtheria, typhoid, tuberculosis and rabies. News items in the more important state papers have also given us valuable information, but unfortunately the number of papers which it has been possible to cover has been small. The services of a press clipping agency whose files covered the county papers of the entire state would be a valuable accessory in this connection.

In order to make the epidemiological information represented by reports from the diagnostic division of the laboratory of value, so that some idea of the prevalence of diphtheria and typhoid over the state would be constantly available, the positive laboratory reports on specimens received for diagnosis and these negative reports on which the physician reported a positive clinical diagnosis have been considered as reports of cases and classified as follows: On large cards, these case reports were classified by postoffices under counties and by the day in which the specimen received under the month. Each card contains sufficient space for the reports of three months. These cards therefore permit of the rapid demonstration of the prevalence of disease in adjoining communities. For further survey, the cases as reported are plotted on a spot map of the state. Such a system as this is absolutely necessary in order to have at all times a clear knowledge of those portions of the state which require the services of the epidemiologist.

A considerable correspondence has been carried on relating to questions of disease control. This has largely arisen from specimens received in

the diagnostic division of the laboratory and in several instances has led to requests for field investigations by the epidemiologist.

The following field investigations have been made:

1. Jewell, typhoid, July 3, 1915, by Dr. Grover.
2. Davenport (State Orphan's Home), smallpox, July 9, 1915, by Dr. Grover.
3. Council Bluffs, typhoid, August 12, 1915, by Dr. Grover.
4. Knoxville (State Inebriate Hospital), typhoid, September 10, 1915, by Dr. Boyd.
5. Clarence, diphtheria, October 14, 1915, by Dr. Boyd.
6. Lorimor, scarlet fever, October 19, 1915, by Dr. Boyd.
7. Cedar Rapids, typhoid, November 3-4, 1915, by Dr. Boyd.
8. Pella, typhoid, November 13-16, 1915, by Dr. Boyd.
9. Lake City, typhoid, December 6-8, 1915, by Dr. Boyd.
10. Marshalltown, diphtheria, January 3-4 and 26-29, 1916, by Dr. Boyd.
11. Waverly, typhoid, April 5-8, 1916, by Dr. Boyd.
12. Ocheyedan, diphtheria, April 20-21, 1916, by Dr. Boyd.
13. Moorhead, diphtheria, June 9-12, 1916, by Dr. Boyd.

A summary of the report prepared as a result of each investigation, copies of which reports have been filed with the local board of health, or the executive officer of the state institution concerned, as well as with the secretary of the State Board of Health, follows. The summaries are presented in chronological order.

From the experience of the past year it is confidently believed that the efficiency and service of the epidemiological division will be very much increased if the following recommendations are granted:

(a) That a satisfactory law be enacted requiring the reporting by physicians of all cases of certain specified controllable diseases they encounter to the proper state authorities.

(b) That the epidemiological division be provided with a portable laboratory for service in the field, which will enable the epidemiologist to perform necessary examinations without the delay attendant to forwarding such material to the central laboratory.

(c) That sufficient funds be supplied the laboratory from which the expenses of field work may be defrayed. By this many communities, especially the smaller ones, will feel free to utilize the services of this division, whereas in the past, many have felt the cost which actually is slight, would be an unwarranted expenditure.

INVESTIGATION NO. 1 SUMMARY.

Typhoid fever, Jewell, Hamilton county, Iowa, July 9, 1915. By Dr. A. L. Grover.

On order from Dr. G. H. Sumner, on account of request from Mr. Wm. Anderson, mayor of Jewell, Iowa.

Reasons—Five cases of typhoid fever.

Epidemiologist found five cases of typhoid fever in B. L., S. S., H. R., C. B, and —. P., the first four of which gave a positive Widal. B. L. sick June 20, H. R. June 22, and S. S. on June 24, and C. B. July 2, and C. B. July 2, and —. P. about July 6. All cases except —. P. frequently ate at the same table at the D— hotel. Two weeks previous to June 20, B. L., the first case, had been away from Jewell for some time at Ellsworth, and is evidently an imported case. Infection of S. S., H. R. and C. B. is evidently by direct or indirect contact with B. L. The fifth case —. P. is a brother of the first case, B. L., and had slept several nights with him in the early stages of typhoid.

Results—All cases have trained nurses. Recommended that the use of public drinking cups and roller towels at the D— hotel be discontinued.

INVESTIGATION NO. 2 SUMMARY.

Small pox, Iowa Soldiers' Orphans' Home, Davenport, Scott county, July 7-8, 1915. By Dr. A. L. Grover.

On order from Dr. G. H. Sumner, Secretary Iowa State Board of Health.

Reason—Prevention of further outbreaks of small pox in the Home.

History—Recently there have been about one hundred and sixty cases of suspected small pox among the inmates of the Home.

Epidemiologist consulted with Mr. F. J. Sessions, the superintendent, and with Dr. W. F. Allen, the attending physician. According to the present prohibitive cost of permanganate, it was decided that the standard method of formalin disinfection might be excused from service and careful scrubbing of isolation quarters with soap and water and subsequently washed with cresol compound in water be used instead. General direction for books, clothes and bedding were given. Recommended that isolation be maintained for one week following complete disappearance of crusts. Milkers and milk handlers should be disease free. Use of common towels and hair brushes should be discontinued. All children admitted or readmitted should be isolated for three weeks after entrance, vaccinated against small pox and their freedom from diphtheria bacilli determined. General sanitation is satisfactory.

INVESTIGATION NO. 3 SUMMARY.

Typhoid fever, Council Bluffs, Pottawattamie county. By Dr. A. L. Grover, August 12, 1915.

By order from Dr. G. H. Sumner, at request of Mr. Lafayette Higgins, Engineer of the Board.

Reason—To investigate prevalence of typhoid in Council Bluffs and to confer with Mr. Higgins relative to recommendations to be made to the city council.

History—For years Council Bluffs has had endemic typhoid fever that became more or less epidemic each spring and fall. In 1914 there occurred quite an extensive epidemic, of at least 80 cases, which was investigated by Mr. Higgins. Cases occurred as follows: January, 0; February, 1; March, 0; April 1; May 4; June 3; July 3; August 10; September 24; October 30; November 3; December 0. The most of the cases were located in the flat portoin of the city along both sides if Indian Creek. The epidemic was slow in onset. There could be found no relation of the cases to the

milk or food supply. 78.5% used city water wholly or in part and 47.4% used well water, while 15.6% may have done so. The city water is carefully treated and daily examinations are made which have not indicated past pollution of the supply. It therefore seems safe in ruling out the city water as a route of infection. There are about 800 wells in the city, most of which are shallow, poorly constructed and in unhygienic situations. A considerable percentage of those examined have been found unsafe, while 3 or 4 public wells were found to have been the source of infection of a large number of cases.

Epidemiologist—Agreed with Mr. Higgins that the great factor in causing typhoid fever in Council Bluffs has been the use of contaminated water from shallow wells. Flies are probably another factor, excessive numbers of which have been observed, and which became infected from filthy privies and Indian Creek. Overflows of Indian Creek, which is practically an open sewer, seem to be chiefly responsible for contamination of the wells.

Recommendations—(1) More rapid extension of sewers and water mains. (2) Compel property owners to connect with public water supply and sewers. Secure a more careful method of collecting and disposing of garbage. A more rigid inspection of living conditions and the handling of milk and food should be maintained. (3) All unsafe wells should be condemned. (4) A complete sanitary survey should be made. (5) Indian Creek should be cleaned up and if possible diverted from the flat portion of the city. (6) Popular education in fly eradication and general hygienic measures should be undertaken.

INVESTIGATION NO. 4 SUMMARY.

Typhoid fever, State Inebriate Hospital, Knoxville, Marion county, Iowa. By Dr. Mark F. Boyd, September 10, 1915.

On order from Dr. G. H. Sumner. Received by 'phone September 9, 1915.

Reason—To investigate causes of prevalence of typhoid fever in State Inebriate Hospital.

History—Hospital has been free from typhoid during this year up to the present time.

Epidemiologist visited the hospital, interviewed the superintendent and found that five cases had occurred in the institution, limited to the employees. The first case F. B. (supervisor) was sick with an indefinite illness during the first week in August, and felt ill during the entire month, was in bed only two days. He consulted a Knoxville physician (Dr. C. M.) who sent a specimen of blood for Widal to laboratory (laboratory number 1251) and received a positive report August 31. Up to this typhoid had not been considered. No precaution had been taken. He left his position and went home to Indianola early in September. At time of visit four cases were seen (H. M., aet 15; E. D., aet 26; C. B., aet 29; and Fo. B., aet 27). Their dates of onset were: 1, September 2; 2, September 3; and 1, September 4. Three are employees of the institution and one H. M., the daughter of the superintendent. Two of the employees sick

live in Knoxville and go daily to work at the hospital and take their meals in the "Old Cottage" dining room. The institution water supply, milk supply, infection from sources outside the institution could be eliminated, and fly infection could also be eliminated. Found that cases F. B., E. D., C. B. and Fo. B. ate at the same table in the "Old Cottage" dining hall, at places close together. It would appear therefore, as if cases E. D., C. B., and Fo. B. are the result of infection by indirect contact with unrecognized case F. B. The relation of case H. M. to the others is not clear, no relationship can be secured. She had been in Woodward and Des Moines within ten days preceeding her illness.

Results—Positive Widals (Lab. No. 1367, 1377) were secured from E. D., and Fo. B. Recommendations made: (1) Close watch of all persons in institution be kept for symptoms suspicious of typhoid. (2) Application of typhoid vaccination to all persons, including those admitted in the future. (3) Requirement of a negative Widal from kitchen or dairy employees. (4) Installation of an efficient wash stand in cook's toilet and that all kitchen employees be required to carefully wash their hands after visiting toilet.

INVESTIGATION NO. 5 SUMMARY.

Diphtheria, Clarence, Cedar county, Iowa. By Dr. Mark F. Boyd, October 14-15, 1915.

By order from Dr. G. H. Sumner. Received by 'phone October 14, 1915.

Reason—To investigate causes of prevalence of diphtheria in Clarence and to ascertain "carriers" of the same.

History—Clarence has been free from diphtheria for some years preceding the present outbreak. The first case, E. E., school girl, aet 9, developed disease September 12, attended school 13th, diagnosis of diphtheria made by Dr. H. T. N. the 13th, and a positive report from the laboratory secured the 14th. Case quarantined the 13th. The next case, E. B., was first seen by Dr. J. E. S. September 20, who took culture and made diagnosis of tonsilitis. Negative report received on culture. Patient was in same room at school as E. E. On the 22d H. B. and W. B. and on October 5th B. B. had "sore throats." On October 1 a baby in the family died after a brief illness, Dr. J. E. S. says from "bronchitis." The death in this family alarmed the school board and board of health and the mayor ordered the H. O., Dr. H. T. N. to take cultures from all members of this family, which he did October 1. Secured positive reports on cultures from H. B., W. B. and E. B. October 2, and family at once quarantined. E. B. was in school the 27-28, 29-30 of September. On October 9, M. B. school girl, aet 9, was first seen by Dr. H. T. N., who suspected diphtheria and quarantined family October 9. Laboratory report positive. M. B. in same room at school as E. E. and E. B. On October 9 Dr. J. E. S. obtained positive culture from his daughter L. S., quarantined October 13. L. S. aet 14, pupil in high school. Dr. J. E. S. has daughter M. S. in same room at school as M. B., E. E. and E. B. Two necessary consecutive negative cultures obtained from E. E. October 5-6, and E. E. released.

Epidemiologist arrived in Clarence 6:40 p. m. October 14, 1915. Saw mayor, met with board of health, school board and the two physicians of the town. Discussed situation and means of controlling diphtheria. At his suggestion the board of health adopted the following regulations: Resolved that whenever the presence of diphtheria is ascertained in Clarence the following regulations to control its spread shall be enforced by the H. O.: (1) Cultures for diphtheria shall be taken from the nose and throat of all pupils in the public schools. (2) All children from whom positive cultures are obtained shall be quarantined according to the rules and regulations of the State Board of Health. (3) All children absent from school at the time H. O. collects the cultures for diagnosis are required to present themselves to the H. O. for the taking of cultures and shall be excluded from school until a report on the same is obtained.

The school had been dismissed for a week on that date and the epidemiologist prevailed on the school board to call the pupils together on the afternoon of the 15th for the purpose of culture taking. Advised against school dismissal and that it be reconvened, but some teachers had already left town for the period of dismissal.

On the morning of the 15th visited all families affected by the condition, took cultures and case histories. In the afternoon took cultures from all pupils and teachers in schools. The turn out was remarkably well, not over a dozen absentees.

Results—Found mayor, health officer, board of health and school board exceedingly anxious to do all in their power to control the disease. Same attitude seems to prevail in the town as witness the remarkable good turn out of pupils at the special call after school had been dismissed. Of 162 cultures taken from pupils and teachers, 10 positives were obtained, reported to H. O. and advised to handle them as per special regulations adopted. Diagnosis was reserved in 21 cultures and the H. O. requested to secure additional cultures from these people and submit them for examination. Since school has been dismissed for the coming week, the H. O. was advised to repeat culture taking from all pupils at time it reopens.

Infection appears to have been disseminated entirely by contact, through attendance at school of E. E. before her case was recognized. Further dissemination by M. B. Infection centers around the second primary room. All other modes of infection can be excluded.

INVESTIGATION NO. 5 SUMMARY (SUPPLEMENTAL).

Diphtheria, Clarence, Cedar county, Iowa. By Dr. Mark F. Boyd, October 21, 1915.

By order from Dr. G. H. Sumner. Received in person October 19, 1915, at the request of Mr. Ballou, mayor of Clarence.

Reason—To assist local health officer, Dr. D. T. Nicolls, in culture taking from school children.

History—Given in preceding report. Following persons found to be carriers as a result of preceding examination of school children October 15: First primary room: Ed. G., E. G.; R. C., N. M.; second primary room: R. K., G. P., R. N., O. O.; intermediate room: None; grammar room: F. D., C. N.; high school: None. Twenty cultures taken at that time were reported diagnosis reserved; of these four, E. B., M. M., W. W., and M. G., have since given positive cultures, 16 have since given negative cultures. Positive cultures were obtained from N. H. L., the school janitor, and from one of the high school teachers, Miss K., who following the closure of schools went to Independence. All carrier cases are under quarantine. Two of the carriers, N. B. and E. E., developed clinical diphtheria following the discovery of the carrier condition, five and two days later respectively. Both cases were mild.

Epidemiologist took 93 cultures from school children and teachers and health officer took 37. The turnout of school children living in town was quite good, as the total number of cultures taken 130, plus the number of school children in households quarantined for carrier cases, about 20, very nearly equals the number of school children living in Clarence. The results of these cultures were as follows: Five positive found, R. R., second primary; V. M., intermediate; M. R., M. R. and L. W. in high school. Diagnosis was reserved in 5 cases, which have subsequently given negative cultures. On the 19th a positive culture was found, taken from a sore on the foot of H. P., a pupil in the intermediate room. Additional positive cultures have since been obtained from Mrs. J. D., Mrs. R. O. N., C. E. B., S. S. and I. F., all of which are reported to have been in direct contact with carrier cases. The epidemiologist learned of a death from diphtheria in the country near Lowden, case A. R. aet 9. Dr. H. A. R., which he investigated by correspondence and cannot find any connection between this case and the Clarence epidemic.

Results—The situation seems to be pretty well under control. The H. O. is handling the situation in a very effective manner. The school board has decided to keep the schools closed for the present week as they consider attendance would be very poor.

INVESTIGATION NO. 6 SUMMARY.

Scarlet fever, Lorimer, Union county, Iowa. By Dr. Mark F. Boyd, October 19, 1915.

By order from Dr. Guilford H. Sumner, Sec.-Executive Officer, State Board of Health, received by 'phone, October 17, 1915.

Reason—To advise with local board of health regarding the control of scarlet fever in Lorimer.

History—Two households, Day and Rhyne, in quarantine with one case in each. Rhyne child onset about ten days ago, promptly recognized and quarantined. H. O., Dr. Lamb, heard of suspicious symptoms in Day child, looked her up, found her in school with enlarged glands at angle of jaw and typical desquamation on arms. Quarantined the 16th. Both children in first primary room at school.

Epidemologist arrived in Lorimer October 19, 1:15 a. m. Met with mayor, health officer and school principal. Found that school had been dismissed the 17th by the board of health. Asked that pupils be reassembled for inspection and advised that school be reconvened. About

two-thirds of pupils from all grades presented themselves (120) for inspection. No suspicious case found. Visited both quarantined houses in town and found typical scarlet fever in each case. Advised mayor of general principles underlying the control of scarlet fever, that all pupils absent from inspection be examined by H. O. before being permitted to re-enter school, and that school be reconvened. Advised that all suspicious cases be quarantined. Advised that teachers search for "sore throats" among their pupils and refer such cases to H. O. for diagnosis.

INVESTIGATION NO. 7 SUMMARY.

Typhoid fever, Cedar Rapids, Linn county, Iowa. By Dr. Mark F. Boyd, November 3-4, 1915.

By order from Dr. Guilford H. Sumner, Sec.-Exec. Officer, State Board of Health, at the request of Mayor Roth of Cedar Rapids, received by 'phone November 2, 1915.

Reason—To assist local H. O. Dr. Beardsley in determining the source of infection of several cases of typhoid fever.

History—Cedar Rapids has been free from typhoid during the past summer. In April and May a small epidemic occurred among the employees of a certain store, and was determined by the health officer to have been due to a defective private water supply at that place. From October 22-29 five cases in the eastern part of Cedar Rapids gave a positive Widal.

Epidemiologist advised H. O. by 'phone November 2 to ascertain from all physicians the frank or suspected cases of typhoid fever in their practice. The following cases were reported and visited:

No	Case	Residence	Age	Sex	Onset	Water	Milk
1	H. A.	1629 2nd Ave. E.	16	F.	Oct. 23	City	A. I. R.
2	S. F.	1723 Grand Ave. E.	16	F.	Oct. 19	City & spring	A. I. R.
3	F. S.	1723 Grand Ave. E.	14	M.	Oct. 24	City	A. I. R.
4	Mrs. K.	1623 2nd Ave. E.	53	F.	Oct. 17	City	A. I. R.
5	L. N.	1739 A. Ave. E.	13	M.	Oct. 17	City	A. I. R.
6	R. M.	1739 A. Ave. E.	2½	M.	Oct. 31	City	A. I. R.
7	R. McC.	1432 3rd Ave. E.	29	M.	Oct. 21	City	A. I. R.
8	L. E.	949 A. Ave. E.	17	M.	Oct. 28	City	Springville
9	Mrs. C. W. H.	804 S. 7th	29	F.	Oct. 15	City	A. I. R.
10	M. C.	1422 N. 6th	10	F.	Oct. 23	City and well	C. R.

Contact infection is probable in case 6. Case 8 had been to West Union and Fayette October 16. It would therefore appear that case 8 is imported. Case 10 had also made several out of town trips.

With exception of case 10 the remainder are all in the east side of the river in the best residential portion of Cedar Rapids, and except cases 8 and 9 are rather closely grouped. The houses are all modern and have sewer connection.

The dates of onset of all cases with the exception of Nos. 6 and 8 are between October 15 and 24th. As has been previously noted cases 6 and 8 are probably contact and imported cases, respectively. Of the total cases, five are females and six males, but excluding 6 and 8 there are

five females and three males. Excluding 6 and 8 again it will be noted that five of the cases are between 10 and 16 years of age, two 29 and one 53 years.

All consideration of infection through foods, ice cream, contact, flies, etc., shows that these considerations may be excluded, as nothing of this nature common to all cases was found.

All cases had used city water at the approximate time of infection, which may have been the last week in September or the first two weeks of October with the exception of cases six and eight. The city water is filtered, and operation of the filters controlled by a competent chemist and furthermore, the water is sterilized by the application of hypochlorite after filtration at the rate of .4 P. P. M. of chlorine. Examination of the records of the bacteriological examinations made at the filter plant of samples collected at various places about town shows that B. coli was absent from 1 c.c. samples of water during this period. A consideration of the distribution of the cases according to residence, age and sex furthermore excludes the city water as a common route of infection.

All the cases, with the exception of cases 7-8-9-10 used as a beverage milk from dairy A. I. R. Case 7 used this milk in coffee and case 9 on cereals. Case 10 used milk from dairy C. R. Case 8 used milk from S. dairy. Case 8 has already been excluded as an imported case. The milk from dairy A. I. R. is from Jersey cows, and is highly regarded in Cedar Rapids because of its richness. There are 7 primary and 1 secondary case occurring among the users of this milk. The dairy A. I. R. supplies daily about 200 quarts of milk to 150 customers. We may consider that probably between 375-400 people consume this milk, or about 1% of the population of Cedar Rapids. If the dissemination of typhoid fever in this instance had been due to some other far reaching route of infection than this milk, we might expect this milk supply to have not over one case among its consumers. Case 10 used milk from dairy C. R. The proprietors of dairies C. R. and A. I. R. are brothers and live not a great distance from each other in the country. It is not unreasonable to suppose that dairyman A. I. R. disposed of some milk to dairyman C. H. during the probable period in which these cases received infection, though such cannot be learned.

A visit was paid to the dairy A. I. R. The milk of this dairy comes from the following farms:

Name	Amount Daily	Facilities for Sanitary Handling	Typhoid History
A. I. R.	150 quarts	Fair—Steam in milk house	A. I. R. and wife had disease 14 years ago.
K.	70 quarts	Fair—Good dairy barn. No facilities for sterilization. No milk house	None.
H	30 quarts	Poor	Mrs. H. had disease 11 yrs. ago.
L.	3 quarts	Poor	None.

K's milk is delivered to A. I. R. already bottled. H. and L. deliver milk to A. I. R. who bottles it. No history of change in supplies or of help handling milk at time of infection was secured at any place. Milk all bottled for retail. At A. I. R.'s place A. I. R., his daughter and hired man handle the milk cans at the H. place. Inspection of the water supply used for washing milk containers on these farms makes contamination appear unlikely. The chemical and bacteriological examination of these waters does not incriminate them as the source of infection.

It appears probable that A. I. R. or Mrs. H. may be typhoid carriers. Sterile bottles were left with these people for the collection and transmission of a specimen of feces, but to date the specimen have not been received.

The H. O. had already advised the mayor to order the milk from dairy A. I. R. to be pasteurized or excluded from the city. Pasteurization is to be performed under the supervision of the milk inspector, who was advised to require the holding of the milk at 145° F. for 20 minutes. The pasteurization is performed at the ice cream plant of A. I. R.'s brother in Cedar Rapids.

Results—The epidemiologist confirmed the H. O.'s belief that milk from this dairy is responsible for the outbreak, and approved his advice to the mayor relative to the pasteurization of this supply. Further advice was not given, pending the results of bacteriological examinations of the persons mentioned for the detection of a carrier condition. If A. I. R. or Mrs. H. are found to be carriers their connection with the handling of milk should cease.

INVESTIGATION NO. 8 SUMMARY.

Typhoid fever, Pella, Marion county, Iowa. By Dr. Mark F. Boyd, November 13-16, 1915.

By order from Dr. Guilford H. Sumner, Sec.-Executive Officer, State Board of Health, at the request of the Board of Health of Pella, received by wire November 12, 1915.

Reason—To assist local health officer, Dr. C. Aschenbrenner, in determining the source of infection of several cases of typhoid fever.

History—Previous to the present outbreak, Pella has had only one case of typhoid fever this summer. This case is No. 4 in the series collected.

Epidemiologist found that only two cases of typhoid fever had been reported to the city clerk. Visited each of the physicians and secured names and addresses of cases of typhoid fever which had occurred. Nine cases were ascertained. These were visited and their histories ascertained.

No.	Case	Residence	Nationality	Age	Sex	Onset
1	J. F.	1311 Main St.	Dutch	25	F.	Oct. 11
2	N. C.	115 S. Main St.	Irish	24	F.	Sept. 17
3	L. B.	503 Huber St.	Dutch	24	F.	Oct. 27
4	A. DeV.	500 University St.	Dutch	37	M.	July 13
5	N. K.	408 S. Main St.	Dutch	14	F.	Oct. 2
6	J. T.	410 S. Main St.	Dutch	19	F.	Sept. 22
7	Mrs. M. F. K.	1½ m. nw. of Pella	Dutch	41	F.	Oct. 10
8	B. D.	608 Liberty St.	Dutch	19	F.	Oct. 7
9	J. M. G.	1½ m. east of Pella	Dutch	43	M.	Sept. 21
10	Mrs. B.	400 E. 2nd St	Dutch	61	F.	Sept. 20
11	Mrs. P. G. G.	902 Penn St.	Dutch	63	F.	Sept. 16

Eight cases had been out of town during the month preceding their illness, but their exposure to contact infection while out of town could not be learned. Cases 2-6-9 had been to the State Fair, Des Moines; cases 3-10 had been in the country adjacent to Pella; case 8 had been to Oskaloosa twice, on September 15 and October 14, and case 11 had returned from San Francisco August 21. It might be noted in this connection that one of the cases in the Knoxville outbreak had attended the state fair previous to her illness.

The onset of case 4, July 13, precedes by two months any of the other cases. The other cases classified according to weeks of onset according to date on which taken to bed are as follows: September 12, 2 cases; September 14, 3 cases; September 26, 1 case; October 3, 1 case; October 10, 2 cases; October 24, 1 case. It is therefore seen that the outbreak is not explosive in character, but has covered a prolonged period of time. From this data it might appear as if the cases were not due to the use for a brief period of a common active route of infection.

Cases 7-9 reside in the country adjacent to Pella (A). Case 1 lives in the northern portion of Pella (D), case 8 in the central (C), and cases 2-3-4-5-6-10-11 in the southern portion (B) of Pella. According to time of onset and distribution, case 4, the first lives in (B), the two cases next developing in the week of September 12, live in (B), two of the three cases developing in the week of September 19 also live in (B). This might suggest contact or fly borne infection in these cases developing in the southern part of Pella, but such does not seem probable.

Of the eleven cases 9 are females and 2 are males. One of the male cases (4) antedates by two months the remaining cases. It will be further noticed that the cases are all in adults or young adults, the youngest, case 5, being 14. This is a rather unusual distribution of cases, and the preponderance of cases in adult females is noteworthy.

Classified according to occupation the cases are grouped as follows: Housewife, No. 10-11-1; clerk, No. 1; telephone operator, No. 2; college student, No. 6-8; school girl, No. 5; farmer, No. 9; laborer, No. 4; at home, No. 3. There is no undue preponderance of cases among members of any occupation.

With the exception of case 4, the home sanitation of all cases developing in Pella is good.

Cases 1-7-9 said their health previous to the attack had been poor. This might possibly indicate that infection took place somewhat earlier than would be judged from the date of taking to bed. The other cases considered their previous health to have been good.

Contact infection only seems possible with case 5, who lives next door to case 6. No history of contact was obtainable with any of the other cases.

Four cases were sole users of the city water and four used it occasionally. These are cases 2-11-6-9-5-1-8-4. Three (10-7-3) used water from private wells exclusively. A consideration of the distribution of cases, their time of onset and age and sex does not indicate that drinking water is responsible for the outbreak.

One case used condensed milk, two cases milk from their own cows, three cases denied the use of milk and four cases used milk from three separate sources. It is evident that milk can be excluded as a route of infection.

Nine people had eaten ice cream at several different places. Four (1-2-6-8) at W; six (2-3-5-6-7-8) at X; three (3-6-8) from V; and three (4-8-10) from other sources; 9 denied the use of ice cream and case 11 was uncertain. The ice cream sold at W, X and Y is manufactured at different places.

All cases had ordinarily secured their meals at home previous to their illness, but 8 cases (1-2-6-7-8-9-10-11) had eaten at a church social (Zendings Fest.) given by the R church on the College premises on Aug. 26. Cases 1-2-11 had secured meals at three different restaurants in Pella and 3-4 had eaten in the country. Cases 2-6-8-9 had also eaten meals while away from Pella in Des Moines and Oskaloosa. This church social seems to be the only possible common place of infection that was discoverable, but it seems remarkable, that supposing infection was contracted there that cases 1-7-8 would be five and six weeks in the incubation stage of the disease. It would further be noted that cases 1-7 state their previous health had been poor, which might indicate nevertheless that recognition of typhoid was delayed. Among other foods served at this social were potato salad, chicken sandwiches and ice cream. Only cases 1-2-6-7-9-11 ate both potato salad and chicken sandwiches. Case 8 did not think she had eaten any thing else besides ice cream and case 10 died before the investigation. We have endeavored to find the sources from which were donated the potato salad and chicken, but so far have been unsuccessful. The ice cream served came from Z, as did also a portion of the butter served. Water was not served.

This social had a very large attendance, which has been estimated as high as 500. It will thus be seen that probably, only a little over 1% of its patrons subsequently developed typhoid. It will be further noted that the 1st case 4, case 5 (contact) and case 3 were not in attendance.

Five cases (2-3-4-6-8) used butter from Z, at their homes; three cases (1-7-9) used butter from various sources in the month preceding their illness. Case 5 did not use Z butter.

Butter from Z is thus the only common ascertainable route of infection common to the cases which were in attendance at the church social and those which were not. The Z butter used at the church social was only about one-fifth of the total butter used. If some article of food at the social had been the route of infection we could, considering the attendance, ordinarily expect a much larger percentage of cases occurring among those who had eaten there. Furthermore the incubation period in certain of the cases is unusually long, considering the church social as the place where infection was acquired. We have been unable to ascertain if the church social cases used Z butter, although it is known that this butter was served.

It was learned that on Aug. 21, the manufacturer of Z butter had purchased 39 pounds of cream from J. V. whose wife had typhoid fever in March and April, 1915. This was the second attack of typhoid fever which

Mrs. J. V. has had, the first occurred while a girl of 3 in Holland. This cream was churned, with other cream, on August 23, without pasteurization before ripening. Efforts are being made to secure a specimen of her feces for laboratory examination. This butter could therefore have been in the local market by the date of the church social. It should be noted that the use of this lot of butter will not explain the origin of case 4.

The transmission of typhoid fever through infected butter is rather an unusual occurrence. This is largely due to certain features in manufacture of butter which are destructive to the tyhpoid bacillus. Milk and cream are very suitable media for the multiplication of the typhoid bacillus, but with the gradual increase of lactic acid in the process of souring the typhoid bacillus undergo a gradual diminution of number. Supposing therefore that a certain lot of sweet cream did become infected, what might we be justified in considering the subsequent chain of events:—with souring the typhoid bacilli undergo a gradual reduction in numbers, furthermore the infected sour cream is diluted with several times its volume of uninfected cream. Diluting and attenuation or destruction of the infective organisms thus occurs. Furthermore the butter made from such cream is not immediately disposed of, but may remain in storage or on the market for several weeks, during which time the strong salt solution in the butter may effect a further reduction of typhoid bacilli present. Therefore commercial butter would not necessarily cause an explosive disease outbreak similar to that caused by infected milk, and furthermore the number of cases in proportion to the size af the infected lot of butter would be much smaller compared with infected milk.

Results—The following recommendations were made:

(1) The prompt reporting of all cases of communicable disease by the attending physician to the city clerk should be insisted by the board of health.

(2) No person who are typhoid carriers or the carriers of other communicable diseases should be permitted to handle food consumed in public places.

(3) Milk sold at retail and cream for the manufacture of ice cream and butter should be pasteurized.

INVESTIGATION NO. 9, SUMMARY.

Typhoid Fever, Lake City, Calhoun County, Iowa. By Dr. Mark F. Boyd. December 6th-8th, 1915.

By request of Local Board of Health, Lake City, transmitted through office of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, received by 'phone December 3, 1915.

Reason—To determine the source of infection of the cases of typhoid fever in Lake City during the past year.

Epidemiologist found that typhoid fever is not a reportable disease in Lake City. Visited each of the physicians and secured names and addresses of cases of typhoid fever which had occurred. These were visited as far as possible and their histories ascertained.

No.	Case	Residence	Occupation	Age	Sex	Onset (to bed)
1	E. S.	W. part town	Shoe merchant	28	M.	May 30
2	F. S. (2)	W. part town	At home	4	F.	June 3
3	L. B.	W. part town	Schoolboy	13	M.	July 4
4	A. B.	W. part town	Schoolboy	7	M.	Nov. 9
5	E. C.	W. part town	H. S. student	19	F.	Nov. 26
6	S. C.	W. part town	Schoolboy	13	M.	Dec. 2
7	O. W.	W. part town	Farmer	37	M.	April 1
8	R. G.	W. part town	Schoolboy	11	M.	July 7
9	T. J.	W. part town	At home	3	M.	July 15
10	Mrs. T.	W. part town	Nurse	65	F.	July 9
11	Mrs. R.	W. part town	Housewife	56	F.	July 6 (?)
12	H. R.	W. part town	Telephone operator	17	F.	July 6 (?)
13	M. W. (deceased)	W. part town	Retired, aged	----	M.	Aug. 1914
14	Mrs. W. (deceased)	W. part town	Retired, aged	----	M.	Aug. 1914

The local physicians inform me that preceding the fatal cases of Mr. and Mrs. W. in 1914, Lake City has been free from typhoid fever for several years, perhaps five or six years.

The age and sex distribution of cases is as follows:

Years	Male	Female	Total
0- 5	1	1	2
6-10	1	0	1
11-20	3	2	5
21-30	1	0	1
31-40	1	0	1
41-50	0	0	0
51-x	1	3	4
	8	6	14

The exact date of onset of the disease in Mr. and Mrs. W. could not be obtained, both dying in September, 1914. The onset of the remaining cases is as follows:

Week Beginning	Case Number	Total
March 28	7	1
May 30	1-2	2
July 4	11-12-8-10	4
July 11	3-9	2
November 7	4	1
November 28	5-6	2
		12

The cases have all been grouped in the extreme southwestern part of Lake City, in a rather compact group. This part of town, while for the most part containing modern houses, is yet poorly sewered and relatively few homes are supplied with city water. The cases have been confined to 8 houses. The house sanitation is as follows:

Number Cases	Sewer	Privy	City Water	Well	Screened	General Condition
1-2	Yes	No	Yes	No	Yes	Good
3-4	Yes	No	Yes	No	Yes	Good
5-6	No	Yes	No	Yes	Yes	Fair
7	No	Yes	No	Yes	Yes	Fair
8	No	Yes	Yes	No	Yes	Fair
9-10	No	Yes	No	Yes	Yes	Good
11-12	No	Yes	No	Yes	Yes	Poor
13-14	No	Yes	No	Yes	No	Poor

Cases 8-9-13-14 are reported to have been out of town immediately before taking to bed. Case 8 had been to Ames (June 30-July 7), case 9 to Wall Lake (July 3-6) and cases 13-14 are stated to have attended the Minnesota State Fair, 1914, but felt ill while there. It does not appear that infection was contracted outside of Lake City.

Contact infection appears possible in case 4 from case 3. No history of direct or indirect contact was obtainable for the other cases. It is striking that 6 homes had 2 cases. With the exception of 3-4 their dates of onset closely approximate, which would appear that these individuals were infected simultaneously from a common source rather than representing secondary household cases.

All consideration of infection through foods, ice cream, contact, flies, etc., indicates that these routes of infection can be excluded, as nothing of this nature common to all cases was found.

Four cases, 1-2-3-4 used city water exclusively, six cases, 5-6-7-8-9-10 used both city and private well water and four 11-12-13-14 private well water exclusively. The results of the examination of the city water and of the private wells used show that none are of a satisfactory sanitary quality, yet notwithstanding this, the age, sex, geographical, household, and seasonal distribution of the cases does not indicate water borne infection.

All of the cases used fresh milk or cream, either as a beverage, on cereals or in hot drinks. Of the cases 10 gave a history of using milk or cream from dairy R at the approximate time of infection. Cases 3-13-14 are said to have used milk from this source, but this information is uncertain. Case 7 used milk from his own cows. At the time of investigation dairy R was out of business, popular opinion having compelled the dairy man to dispose of his cows. He had also left the town so that a personal interview with him was not obtained. This dairy is reported to have daily disposed in Lake City of places the amount around 225 quarts. Milk from this dairy was therefore less than 5% of the total daily supply of the town, yet among users of this milk, occurred definitely 73% and probably 93% of the cases of typhoid fever that occurred in Lake City this past year. Furthermore the cases are localized to that part of town wherein this milk was distributed. The large proportion of homes wherein two individuals were attacked and the preponderance of cases among the young and the old are also characteristics common to other milk-borne outbreaks.

While the evidence makes it appear likely that milk from dairy R served as the route of infection, yet the source of the infection is not

certain. Dairyman R and his wife are stated to have had typhoid fever 25 and 15 years ago respectively. It is not unlikely that either may have become active typhoid carriers within the past year. The health officer will endeavor to secure fecal specimens for bacteriological examination from these individuals on their return to Lake City. There is another peculiar circumstance that may have been responsible for the infection of this supply. As will be noted case 7 is the first case developing in 1915. This man is a farmer living in the west part of town and sold about 10 quarts of milk a day. He also is a very close neighbor with dairyman R and social contact between the two houses was quite intimate. For three weeks following the date on which case 7 took to bed (April 21) milk from his premises was retailed in Lake City. This was stopped by the health officer. Following this for a period of five weeks, this milk was taken to dairyman R's and separated, the skim milk being fed to hogs and the cream shipped to a creamery. If the milk from case 7's premises had been infected, dairyman R's milk equipment may have received infection from this source, yet no cases of typhoid are known to have occurred among the users of case 7's milk despite the opportunity by its disposal for three weeks following the onset of his illness. Cases 1-2 might have become infected through the contamination of R's utensils with milk from case 7's premises, but the onset of the other cases is five weeks and longer after this practice ceased. If case 7 was responsible for the infection of R's milk the source from which he and cases 13-14 received infection is not clear. On the other hand if either R or his wife are carriers the infection of 7-13-14 is explainable. Both R and his wife are reported to have handled the milk and milking utensils. R did not have special facilities for the sanitary production of handling of milk.

Results—Since R has quit the milk business the immediate question regarding the prevention of further infection of this supply is solved. Recommendations were made as follows: (1) The city should endeavor to properly safeguard its municipal source of water supply. (2) To extend and encourage the use of the safeguarded municipal supply in preference to the surface wells and (3) to extend its sewerage system and compel the abandonment of privies and enforce the connection of homes with sewers. Advice on these questions may be obtained from the Sanitary Engineer of the State Board of Health. (4) Furthermore the board of Health should insist upon the prompt reporting of all cases of communicable diseases by the attending physician to the health officer. (5) No person who are typhoid carriers or the carriers of other communicable diseases should be permitted to handle food in public places. (6) Milk and cream sold at retail should be pasteurized.

INVESTIGATION NO. 10—SUMMARY.

Diphtheria, Marshalltown, Marshall county, Iowa. By Dr. Mark F. Boyd, Jan. 3-4 and 26-29, 1916.

By an order from Dr. G. H. Sumner, Secretary-Executive Officer, State Board of Health, received by telephone December 29, 1915.

Reason. To investigate and advise local board of health regarding the control of diphtheria in Marshalltown.

Epidemiologist. On Jan. 3 was told by health officer that diphtheria had been excessively prevalent in Marshalltown since Sept., 1915, and that most of the cases had occurred in the west and southwest portion of Marshalltown, among pupils of the Glick, Arnold, Franklin and parochial schools. Since June 1, 56 houses had been quarantined for the disease. Met informally with local board, health officer and superintendent of schools. Stated to board the conditions under which we would undertake to assist them, but board did not make a formal request therefor. Stated to board that the disease appeared to be quite widespread in the city, and that it could only be rapidly and certainly controlled by the recognition and quarantine of all diphtheria carriers, more especially those among school children. Suggested to board that a search for carriers be instituted among the schools in the city, that carriers detected be quarantined until two consecutive negative cultures are obtained, that other members of carriers' households be likewise cultured and handled, that absentees from school at time of culture taking be required to have a negative culture for readmission, and should further cases appear in any school room that had been once cultured, that second cultures be taken from the pupils exposed to patient. Found that this would mean the taking and examining of cultures from some 3,000 children. Board of health informally assented and directed health officer to carry out the work. On January 5 in company with the health officer visited the Glick school and with his assistance cultured the pupils, taking 235 cultures from noses and throats. The magnitude of the undertaking and the limited facilities of the laboratory to handle the cultures expeditiously was explained to the board and health officer and they were told it would be necessary to return to Iowa City and assist in the examinations. Made arrangements to supply health officer with media and swabs as needed. Gave the principal newspaper (Times-Republican) an article on the means of transmission and control of diphtheria which they courteously published. January 5, returned to Iowa City and made arrangements at the laboratory to handle the work as expeditiously as possible with the small staff available. By January 25th, wholesale culture taken from all schools, ten in number was completed. The results of the last consignment were reported two days later.

In this interval there were examined 2,630 primary cultures taken from children at school. Of these 144 were positive, on 289 diagnosis was reserved and 2,197 were negative. An additional 987 cultures were received from the health officer which consisted of release cultures from carriers, from absentees at the time their school was cultured (27 positive obtained), and the employees of the Telephone Co. (2 positive). Of these, cultures to the number 304 were taken from those whose first cultures were reported as diagnosis reserved. Of these 253 were negative, 20 positive and 31 continued as diagnosis reserved. This is a total of 3,617 cultures in the carrier search, received at the laboratory from the health officer or the other routine work of the laboratory. It would have been better had the laboratory sufficient staff to make these examinations in one, two or three days, but it was impossible to secure more than three men

for the diagnostic work. Furthermore, this great number of examinations necessitated the manufacture of large amounts of media, cleaning of glass ware, making of smears from cultures and recording and reporting of the results, all of which taxed the capacity of the laboratory staff; diagnosticians, attendants, and clerks, to the utmost, as it was all in the nature of extra work.

After the culture taking was completed, the epidemiologist, on January 26, returned to Marshalltown. Found that carriers were being excluded from school but were permitted to go elsewhere in the city. Their homes were placarded "Diphtheria Carrier." They came to the health officer's office for culture taking. Follow up culture taking in the homes of carriers had not been undertaken. Health officer and his private assistant were deluged with work incident to the search, and extra assistance had not been provided him by the city.

Obtained a list from records kept by chief of police of all diphtheria quarantines established since May, 1915, and the addresses of the carriers. Spoke on the work being done, its advantages and handicaps, in an extemporaneous talk before the County Medical Society. Ep. in next three days visited 53 households on the list obtained and interviewed persons in 39 households, in which had occurred 51 cases of diphtheria. No households were visited that were under quarantine at the time of visit. Because of length of time between the incidence of the disease and the time of the interviews, and the consequent failure to recall detailed circumstances connected with the opportunities for the receipt of infection, the Ep. limited the scope of his inquiries principally to the opportunities which each case had offered for the further spread of infection.

As a result of the inquiry it appears that frequent irregularities in the termination of quarantine have occurred, neither the 28 day period nor the obtainance of two consecutive negative cultures having been observed. Some individuals have been released while still giving positive cultures. It is highly significant that no less than six of the individuals found to be carriers in the public schools were from homes that had been irregularly released. Three of these homes had been under quarantine as far back as September, 1915, so that the carriers from these households had probably been associating with other children for nearly three months before their detection. These carriers attended the Arnold, Child's and Parochial schools. From a comparison of the results of the laboratory examinations with the quarantine records it appears that several cases, some of which were clinically diagnosed diphtheria with negative cultural findings and also others positive findings were neither reported nor quarantined. These conditions appear to have been largely responsible for the present prevalence of the disease.

The Ep. met with the Board and Health Officer in an informal meeting Saturday afternoon, January 29th, and presented the foregoing situation to them. The importance of the maintenance and continuance of isolation in diphtheria cases and carriers until the case and its associates are found to be free from diphtheria bacilli, was emphasized. The following suggestions were made to the board: That it satisfy itself that proper regulations regarding diphtheria quarantine had been observed before

release therefrom is permitted; that the regulations of the State Board of Health be adopted and enforced by them together with additional regulations regarding carrier cases. It was further suggested that culturing be carried on among the families of carriers, and where wage earners were found to be carriers, that culturing of their associates at their place of employment be performed.

Results—The carriers have not been adequately handled, but despite this, no further cases of diphtheria have arisen among school children after the culturing was completed. Because of this the full value of the carrier search has probably not been realized. The number of new cases seems to be on the decline, none having been reported between January 19 and 26. Two, however, were reported on January 26 and 29 respectively. The local board instructed their attorney to draft a resolution that would include the suggestions offered and would be adopted Monday, January 31st.

INVESTIGATION NO. 11 SUMMARY.

Typhoid fever, Waverly, Bremer county, Iowa. By Dr. Mark F. Boyd, April 5-7, 1916.

By order Dr. Guilford H. Sumner, Sec.-Exec. Officer State Board of Health, at the request of Mayor Osincup of Waverly, received by wire April 4, 1916.

Reason—To determine the cause of the recent prevalence of typhoid fever in Waverly.

History—For some years past Waverly has been free from typhoid fever, except a few cases known to be imported. The occurrence of several cases within the past year has caused much concern.

Epidemiologist met with Waverly physicians at mayor's office April 5th to learn of all real or suspected typhoid cases since recent appearance of disease. Learned of twelve cases of whom nine were still in town. These were visited. They are summarized as follows:

No.	Residence	Age	Sex	Onset	Water	Milk	Out of Town
1	120 S. Linn	6	M.	4-19-15	City	Lidner	No (Iesha
2	503 E. Bremer	35	M.	4-22-15	City & well	Fossmann	Chicago and Wau-
3	420 W. Jefferson	22	M.	5-15-15	City	Goodspeed	Probably (Falls
4	122 S. Elm	23	M.	11-19-15	City & well	Goodspeed	Oran and Cedar
5	715 Fremont	46	M.	12- 1-15	City	Condensed	Strawberry Point
6	502 N. Elm	23	M.	2-14-16	City	Goodspeed	Minneapolis and
7	79 Penn	17	F.	2-16-16	City & well	Milk Factory	No (Waterloo
8	206 W. Water S.S.	40	M.	3-11-16	City & well	McRoberts	Waterloo
9	519 N. Oak	3	F.	3-17-16	City	Lidner	No
10	Wartburg Dormitory	18	M.	3-21-16	City	Mrs. Wheeler	Jessup

With the exception of case 2, all the cases reside west of the river, where 5-7 of the town's population resides. However, four of these cases worked in the business district of the town, which is chiefly east of the river. The distribution is therefore not unequal. None of the cases are closely grouped, but widely scattered all over the town. The home sanitation of all is good.

Six of the cases had been out of town in the month preceding their illness, but it does not seem probable that a town would receive as large a series of imported cases from such a number of other places as this. Infection was probably contracted locally.

The onsets of the various cases are widely scattered as regards time. Three occurred in April and May of 1915; two in November and December of 1915 and five in February and March of 1916. The time of infection has therefore been in the colder months of the year. The summer and fall have been entirely free.

Three of the cases are females and seven are males. Two are between 1-10 years of age; two between 11-20 years, three between 21-30 years, two between 31-40 years and one between 41 and 50 years. There does not appear to be any preponderance of cases in any particular age group but rather the cases are quite uniformly distributed.

All consideration of infection through foods, milk and other dairy products, contact flies, etc., shows that these potential routes of infection may be excluded, as nothing of this nature common to all or the majority of the cases was found.

All of the patients had used the city water prior to their illness. Six used it exclusively, three used it principally and one used it occasionally. This was the only discoverable possible route of infection common to all the cases. The wide and scattered distribution of the cases over Waverly, and their uniform age distribution indicate that the active route of infection was wide-spread among the population. That the water supply was responsible is further indicated by the distribution of the cases in the winter and spring months.

Waverly's public water supply is obtained from an artesian well, the water of which flows into a reservoir of about 50,000 gallons capacity, about 60 feet from the bank of the Cedar River. The top of the reservoir is flush with the ground. The walls are of limestone, and the mortar between the stones appears to be disintegrating, permitting seepage all around the sides. About 8 feet from the top an overflow pipe had been placed, to permit the excess well water in the reservoir to empty into the river. In the early part of March, 1916, during high water in the river, it was found that a reversal of flow was taking place through this pipe, and river water entering the reservoir. This was detected about March 12th and the mayor promptly notified everyone to boil the city water before using it for drinking. Definite evidence of rises in the Cedar river at probable times at which the cases received infection was not obtainable, as a gauging station is not maintained. From conversation with persons familiar with the river, it seems that such rises did occur, with consequent contamination of the artesian well by river water. The relatively few cases of typhoid that occurred would indicate the infection of the supply was very dilute.

Results—The epidemiologist met with the city council and the local physicians and presented to them the epidemiological evidence collected, which indicates that a grave defect in the city water supply was responsible for the present prevalence of typhoid fever. It was recommended that an emergency hypochlorite plant be installed and that changes

be made in the city water system to render unnecessary the use of the present defective reservoir and that adequate storage of well water for fire protection be made, to avoid the use of river water at such emergencies. The council ordered the city engineer to construct the hypochlorite plant and is considering ways and means for the other changes recommended.

INVESTIGATION NO. 12 SUMMARY.

Diphtheria, Ocheyedan, Osceola county, Iowa. By Dr. Mark F. Boyd, April 20-21, 1916.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, received by mail, April 19, 1916.

Reason—To confer with local board of health regarding the control of diphtheria in Ocheyedan.

History—Ocheyedan had been free from diphtheria for some time previous to April 1, 1914. Since then, to the present, there have occurred 27 cases in 13 households, 11 of which were during 1914, 9 in 1915 and 7 in 1916. The continuance of the disease finally led the health officer, Dr. D. G. Lass, to undertake search for carriers among the school children, April 13 and 19. He took the cultures and forwarded them to the laboratory at Iowa City. Five carriers were found, 4 of whom live in the country. One family is under quarantine at present, having had 2 cases.

Epidemiologist called a conference with the local board of health and the physicians of Ocheyedan and discussed the sources of infection and means of transmission of diphtheria. The methods of controlling diphtheria was explained, the action of the health officer in instituting a carrier search was commended and the regulations of the State Board of Health explained in great detail. The next day the epidemiologist conferred with the health officer and the other physician of Ocheyedan and secured from them data concerning the past prevalence of diphtheria in Ocheyedan.

Results—The board is deeply interested in the eradication of diphtheria from its jurisdiction and will sustain the work undertaken by its health officer.

INVESTIGATION NO. 13 SUMMARY.

Diphtheria, Moorhead, Monona county, Iowa. By Dr. Mark F. Boyd, June 9-12, 1916.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, delivered in person.

Reason—To assist local board of health in controlling diphtheria in Moorhead.

History—Previous to December, 1915, Moorhead has been free from diphtheria for some years. Since that time 14 cases have occurred in 7 households. Of these 2 occurred in December, 3 in January, 6 in February, none in March, 1 in April, May and June each, respectively. At present one home is under quarantine, the June case.

Epidemiologist conferred with health officer and board. All children were directed to report at school house for culture taking on June 10. All past cases at present released and some of the members of their

household were cultured. A total of 59 cultures were secured. Perhaps nearly one-half the school children were cultured, the balance being mainly the older boys, who were working in the country during vacation. Cultures examined next day. Two households were found to harbor carriers, 4 being present in one, and one in the other. Diagnosis on one specimen taken from a recent convalescent, was reserved. The family with four carriers was one which had a mild case of diphtheria in February, the patient of that time still harbors diphtheria bacilli. The carrier in the second household lived across the street from the above family. Second culture from this case was negative, while the recent convalescent gave a positive culture. All positive cultures were brought back to Iowa City for virulence tests.

Results—Carriers agreed to co-operate by remaining isolated at home without being quarantined while virulence tests were being performed. Board advised to one culture method exclusively for releasing from quarantine. If further cases of diphtheria arise culture taking among possible contacts of patient in search for carriers was advised. Local officials are anxious to control situation.

SUMMARY.

In Table I is presented a brief review of the activities of the laboratory during the past biennium.

Table III. shows the volume of work that has been handled in the laboratory by fiscal years since its establishment. It demonstrates that since that time the work has undergone a steady and continuous increase, until during the past biennium nearly five times as much work has been performed as was accomplished during the first two years of the laboratory's existence.

TABLE I

SUMMARY OF THE WORK OF THE BIENNIUM.

A. CENTRAL LABORATORY, IOWA CITY.

	1914-15	1915-16	Summation	Total
I. Diagnostic Division				
a. Outfits distributed	20,272	20,796		
b. Specimens received				
Diphtheria	6,458	12,139	18,597	
Typhoid	2,150	2,222	4,372	
Tuberculosis	3,269	3,412	6,681	
Rabies	81	65	146	
Gonorrhoea	77	103	180	
Meningitis	2	9	11	
Water	90	0	90	
Misc.	66	280	346	
Total	12,193	18,230	Summation	30,423

SUMMARY OF THE WOPK OF THE BIENNIUM—Continued

	1914-15	1915-16	Summation	Total
II. Immunization Division				
Anti-rabic injec.	750	1,650	2,400	
Anti-typhoid injec.	363	345	708	
Anti-smallpox inoc.	0	29	29	
Total	1,113	2,074	Summation	3,187
III. Water Analysis Division				
Water	0	1,136	1,136	
Ice	0	18	18	
Sewage	0	67	67	
Total	0	1,221	Summation	1,221
IV. Epidemiological Division				
Field investigations	0	13	Summation	13
Grand totals	13,306	21,538		34,844

TABLE II

B. AUXILIARY LABORATORIES (11).

	1914-15	1915-16	Summation	Total
I. Diagnostic				
Diphtheria	1,061	1,472	2,533	
Typhoid	68	237	305	
Tuberculosis	175	396	571	
Misc.	91	2,132	2,243	
Total	1,385	4,257	Summation	5,642
Grand totals	14,691	25,795		40,486

TABLE III

ANNUAL AND BIENNIAL VOLUME OF WORK SINCE ESTABLISHMENT OF THE LABORATORY.

Year	Fiscal Period	Volume	Biennium	Volume
1	July 1, 1904—June 30, 1905	3,580	1st	8,779
2	July 1, 1905—June 30, 1906	5,199		
3	July 1, 1906—June 30, 1907	8,433	2nd	17,289
4	July 1, 1907—June 30, 1908	8,856		
5	July 1, 1908—June 30, 1909	10,437	3rd	22,961
6	July 1, 1909—June 30, 1910	12,524		
7	July 1, 1910—June 30, 1911	13,437	4th	27,078
8	July 1, 1911—June 30, 1912	13,641		
9	July 1, 1912—June 30, 1913	17,464	5th	35,432
10	July 1, 1913—June 30, 1914	17,968		
11	July 1, 1914—June 30, 1915	14,691	6th	40,486
12	July 1, 1915—June 30, 1916	25,795		

RECOMMENDATIONS.

The following recommendations are presented for the Diagnostic Division, formerly the bacteriological laboratory of the State Board of Health.

a. In order to properly cope with the increased volume of work which the laboratory is being called upon to do and also to provide means for certain important bacteriological examinations in connection with typhoid fever, the laboratory appropriation should be increased by two thousand dollars.

b. In order that scope of the laboratory work may be increased by adding the Wasserman test for syphilis and examinations for the detection of gonococci to the routine work of the laboratory, an additional two thousand dollars should be provided.

c. These two recommendations would increase the support fund of the Diagnostic Division, which is administered by the State Board of Health, from six thousand to ten thousand dollars. Their granting will very materially increase the usefulness of the laboratory to the people of the state.

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