State of Iowa

1919

REPORT OF THE

STATE BOARD OF HEALTH

FOR THE

Biennial Period Ending June 30, 1918

GUILFORD H. SUMNER, M. D.
SECRETARY

Published By
THE STATE OF IOWA
Des Moines

LETTER OF TRANSMITTAL.

HON. W. L. HARDING, 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, 1916, and ending June 30, 1918.

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

Des Moines, December 31, 1918.

IOWA STATE BOARD OF HEALTH

MEMBERS OF THE BOARD

EX OFFICIO MEMBERS

Hon. W. L. Harding, Governor.....Des Moines
Hon. W. S. Allen, Secretary of State.....Des Moines
Hon. Frank S. Shaw, Auditor of State.....Des Moines
Hon. E. H. Hoyt, Treasurer of State.....Des Moines
Dr. Guilford H. Sumner, Secretary-Executive Officer.....Des Moines

BOARD MEMBERS

Dr. Walter L. Bierring, President.....Des Moines
Dr. George F. Severs.....Centerville
Dr. Clinton E. Harris.....Grinnell
Dr. Frank T. Launder.....Garwin
Lafayette Higgins, C. E., Vice President, Sanitary Engineer.....Des Moines

STATE EXAMINATION OF PHYSICIANS

Dr. Walter L. Bierring, President.....Des Moines
Dr. Guilford H. Sumner, Secretary-Executive Officer.....Des Moines
MEMBERS—The Physicians of the State Board of Health

STATE EXAMINATION OF NURSES

Dr. Clinton E. Harris.....Grinnell Clara M. Swank, R. N...Cedar Rapids
Dr. Frank T. Launder.....Garwin Helen S. Hartley, R. N...Des Moines

STATE EXAMINATION OF EMBALMERS

Dr. George F. Severs.....Centerville Charles Emerson, L. E.....Creston
Dr. Clinton E. Harris.....Grinnell C. S. Hopkins, L. E.....Lake City

STATE EXAMINATION OF OPTOMETRISTS

James McDonald, Pres.....Washta James G. McMasters...Cedar Rapids
George S. Dunlap.....Sioux City Dr. George F. Severs....Centerville

LABORATORIES FOR STATE BOARD OF HEALTH

Dr. Henry Albert, Director.....Iowa City
Dr. John H. Hamilton, Epidemiologist.....Iowa City
Mr. W. E. Burns, Junior Bacteriologist.....Iowa City
Mr. Jack J. Hinman, Jr., Senior Water Bacteriologist and Chemist.Iowa City
———, Junior Water Bacteriologist and Chemist.....Iowa City

STATE REGISTRATION OF VITAL STATISTICS

Dr. Guilford H. Sumner, State Registrar and Superintendent.....Des Moines

LEGAL DEPARTMENT

Hon. H. M. Havner, Attorney General.....Des Moines
Assistant Attorneys General:
Hon. J. W. Sandusky.....Des Moines
Hon. F. C. Davidson.....Des Moines
Hon. W. R. Kendrick.....Des Moines

INSPECTION OF LODGING HOUSES AND HOTELS

J. B. Heefner, Hotel Inspector.....Des Moines
Deputy Hotel Inspectors:
H. K. Horning.....Des Moines
C. J. Buckley.....Waterloo

BACTERIOLOGICAL EXAMINATIONS AND CHEMICAL ANALYSES

Dr. Henry Albert, Director, Laboratories for State Board of Health.Iowa City

---

N. B.—Correspondence relating to examination 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 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.

All correspondence relating to SANITARY ENGINEERING should be addressed to Prof. Lafayette Higgins, Sanitary Engineer, Iowa State Board of Health, Capitol Building, Des Moines, Iowa. All correspondence relating to EPIDEMIOLOGY, SANITARY ANALYSIS OF WATER AND ICE, and BACTERIOLOGICAL EXAMINATIONS should be addressed to Dr. Henry Albert, Director Laboratories for State Board of Health, Iowa City, Iowa.

REPORT OF STATE BOARD OF HEALTH

The following departments form the state board of health:

I. State Board of Health
II. Medical Examiners (Physicians)
III. Nurses Examiners (Nurses)
IV. Embalmers Examiners (Embalmers)
V. Optometry Examiners (Eye-Glasses)
VI. Vital Statistics (Marriages, Divorces, Births, Deaths)
VII. Hotels Inspections (Three Inspectors)
VIII. Sanitary Engineering (One Sanitary Engineer)
IX. Educational Bulletins (Literature on Health)
X. Antitoxin Distribution (Prevention of Diseases)
XI. Bureau of Venereal Diseases (Government and State)
XII. Bacteriological Laboratories (State University)
XIII. Collaborating Epidemiologist (Government Reports)

All of the above are established by law and all are in full operation, and the secretary-executive officer supervises all of the work.

I. The members of the state board of health and the secretary are appointed by the appointing board composed of the governor, secretary of state and auditor of state, and the secretary of the executive council is the secretary of the appointing board. All members of the executive council are members of the state board of health ex-officio.

II. The medical examiners are composed of the physician members of the state board of health.

III. The nurses' examiners are composed of two physicians of the state board of health, the secretary and two nurses appointed by the state board of health. The nurses are appointed annually.

IV. The embalmers' examiners are composed of two physicians of the state board of health, the secretary and two embalmers appointed by the state board of health. The embalmers are appointed annually.

V. The optometry examiners are composed of one physician of the state board of health, the secretary and three optometrists. The optometrists are appointed annually by the governor.

VI. The state registrar of vital statistics is the secretary of the state board of health, by virtue of his being the secretary.

VII. The hotel inspector is appointed by the state board of health and serves for two years. The hotel inspector appoints two deputies.

VIII. The sanitary engineer is appointed by the board of appointment and serves as a member of the state board of health and his term is for five years.

IX. The educational bulletins are edited by the secretary and published quarterly.

X. Antitoxin distribution is supervised by the secretary at 300 distributing centers or stations.

XI. Bureau of venereal diseases is in connection with the state board of health and is in charge of a director and an assistant, supervised by the state board of health.

XII. Bacteriological laboratories are located at the state university and are under the supervision of a director and are supervised by the state board of health.

XIII. The secretary of the state board of health is the collaborating epidemiologist of the U. S. government and makes regular reports to the government.

EXAMINATIONS IN VARIOUS DEPARTMENTS, STATE BOARD OF HEALTH.

1.	Number of physicians and osteopaths examined from January 1, 1918, to December 31, 1918		123
2.	Number of physicians licensed by reciprocity January 1, 1918, to December 31, 1918	29	152
3.	Number of itinerant's licenses issued January 1, 1918, to December 31, 1918	3	1
4.	Number of embalmers examined January 1, 1918, to December 31, 1918	70	
5.	Number of embalmers licensed by reciprocity January 1, 1918, to December 31, 1918	6	76
6.	Number of nurses examined January 1, 1918, to December 31, 1918		397
7.	Number of nurses' reciprocity certificates issued January 1, 1918, to December 31, 1918	18	415
8.	Number of optometrists examined January 1, 1918, to December 31, 1918	16	16
9.	Number of examinations held for physicians and osteopaths for the year 1918		4
10.	Number of examinations held for embalmers in 1918		2
11.	Number of examinations held for nurses in 1918		4
12.	Number of examinations held for optometrists in 1918		2

For the year 1918, beginning with January 1st and ending with December 31st, the following number of cases of quarantinable and placard diseases were reported to the state board of health:

1.	Scarlet fever	2,730
2.	Diphtheria	921
3.	Smallpox	3,307
4.	Cerebrospinal meningitis	59
5.	Poliomyelitis (infantile paralysis)	176
6.	Chickenpox	135
7.	Mumps	1,269

8.	Measles	1,205
9.	Whooping cough	102
10.	Spanish influenza (including pneumonia) (Oct., Nov., Dec.)	93,590
11	Syphilis	704
12.	Gonorrhea	1,899

DEATHS IN IOWA DURING YEAR 1918.

Total deaths (exclusive of stillbirths)	31,800
Stillbirths	1,109
Deaths from influenza (Oct., Nov., Dec.)	6,116
Deaths from broncho-pneumonia	599
Deaths from pneumonia	3,085
Deaths from empyema	129
Deaths from congestion of lungs	93

Month	Stillbirths	Deaths exclusive of Stillbirths	Influenza (pneumonia excluded)	Broncho-Pneumonia	Pneumonia	Empyema	Cong. of Lungs
October	102	4,544	1,905	132	711	19	17
November	436	3,649	1,079	10	295	13	4
December	91	4,509	2,355	89	439	6	2

ANTITOXIN DEPARTMENT.

Following is a report of the antitoxins and vaccines, known as the Iowa state board of health products, manufactured by E. R. Squibb & Sons of New York, and distributed from the office of the Iowa state board of health through 300 stations established in the state of Iowa. This report covers a period during the calendar year January 1, 1918, to January 1, 1919.

METHOD OF DISTRIBUTION: The Iowa state board of health contracts by bid with a manufacturer for diphtheria antitoxin, tetanus antitoxin, typhoid vaccine and smallpox vaccine to be distributed in the state at a contract price. The manufacturer who gets the contract consigns to the Iowa state board of health office a supply to be used in filling emergency orders.

OBJECT OF DISTRIBUTION: The board recognized the fact for several years that the price of antitoxin was prohibitive in a good many cases, and in others the use of it was delayed because of its expense. This was not due to the fact that either the manufacturer or the retailers were making a big profit, but the cause is in the deterioration of the antitoxin, making it necessary to renew it once in fifteen to eighteen months at least.

The legislature makes an annual appropriation of $2,000 to defray the expense of handling the emergency stock in this office which is consigned to us by the manufacturer, and emergency orders only are filled from this office. All other orders go direct to laboratories of manufacturer, and we estimate that the emergency orders received at this office comprise half of the stock used in the state, the other half being ordered direct from laboratories.

COMPARISON OF PRICES.

	Druggists' Prices	State Prices	Saving
Diphtheria Antitoxin—			
1000 units	$ 2.00	$ .50	$ 1.50
3000 units	5.00	1.25	3.75
5000 units	7.50	1.80	5.70
10000 units	12.00	3.35	8.65
Tetanus Antitoxin—			
1500 units	$ 2.50	$ 1.67	$ .82
3000 units	4.25	2.87	1.38
5000 units	6.00	4.00	2.00
Typhoid Vaccine—			
30 Ampul (10 treatment) pkg	$ 5.00	$ 2.50	$ 2.50
3 Ampul (1 treatment) pkg	.75	.28	.47
3 Syringe (1 treatment) pkg	2.25	.85	1.40
Smallpox Vaccine—			
5 tubes (5 vaccinations) pkg	$ 1.00	$ .40	$ .60
10 tubes (10 vaccinations) pkg	2.00	.80	1.20

During year 1918 we distributed from this office 6,295 packages diphtheria antitoxin, which means a saving of.....$24,422.50

Tetanus antitoxin, we distributed 619 packages, which means a saving of..... 759.96

Typhoid vaccine, we distributed 1,845 packages, which means a saving of..... 1,148.51

Smallpox vaccine, we distributed 40,545 vaccinations, which means a saving of..... 4,865.40

Total saving to the people in one year on goods shipped from the Iowa state board of health office only.....$31,196.67

FINANCIAL STATEMENT OF MONEY TURNED INTO STATE TREASURY DURING BIENNIAL PERIOD BEGINNING JULY 1, 1916, ENDING JUNE 30, 1918.

STATE BOARD OF HEALTH.

Paid into state treasury—

June 30, 1917.....$ 91.63

June 30, 1918..... 250.58

For biennial period.....$ 342.21

ANTITOXIN DEPARTMENT.

Paid into state treasury—

June 30, 1917.....$ 744.92

June 30, 1918..... 436.29

For biennial period.....$1,181.21

MEDICAL EXAMINERS.

Paid into state treasury—

June 30, 1917.....$2,787.76

June 30, 1918..... 2,152.01

For biennial period.....$4,939.77

Paid into state treasury—

Itinerant license paid August, 1917.....$ 250.00

Itinerant licenses paid March, 1918..... 750.00

For biennial period.....$1,000.00

EMBALMERS' EXAMINERS.

Paid into state treasury—

June 30, 1917.....$ 533.52

June 30, 1918..... 716.22

For biennial period.....$1,249.74

NURSES' EXAMINERS.

On hand July 1, 1918.....$3,315.23

This is a continuous account and is used for the nurses alone. No person connected with the state board of health receives any money from this fund except the two nurses who are members of the nurses' examining board.

OPTOMETRY EXAMINERS.

On hand June 30, 1918.....$1,139.02

Retained in department June 30, 1918..... 500.00

Paid into state treasury June 30, 1918.....$ 639.02

Nothing was turned into the state treasury in 1917, but there was retained the sum of $500.00 or less in accordance with the law governing this matter. This relates to the optometry examiners only.

VITAL STATISTICS.

(For certified copies of birth and death certificates.)

Paid into state treasury from July 1, 1916, to July 1, 1917.....$ 155.40

From July 1, 1917, to July 1, 1918..... 166.65

Paid into state treasury for biennial period.....$ 322.05

Total amount paid into state treasury from above departments during biennial period..... 9,674.00

MONEY ON HAND JANUARY 1, 1919, IN FOLLOWING DEPARTMENTS.

Department	Appropriation	Balance Jan. 1, 1919
State board of health	$5,000.00	$2,670.82
Antitoxin department	2,000.00	1,325.94
Vital statistics department	3,000.00	1,682.39
Medical examiners	Fees	1,377.87
Embalmers' examiners	Fees	1,285.35
Nurses' examiners	Fees	4,124.77
Optometry examiners	Fees	982.55
Bacteriological laboratory	8,000.00	4,091.72

GUILFORD H. SUMNER, M. D.,

Secretary-Executive Officer, Iowa State Board of Health.

December 31, 1918.

N. B. Iowa appropriates 13 mills each year for the health of each person in the state. It should be observed from the above statements and reports that the State Board of Health is very economically managed. Cannot the legislature trust us with more funds in order that we may do more and better work? G. H. S.

TABLE NO. 1—QUARANTINABLE DISEASES IN IOWA.

Number Reported for Iowa, by Months, for Biennial Period Ending June 30, 1918.

	Scarlet fever	Diphtheria	Smallpox	Cerebrospinal meningitis	Anterior poliomyelitis	Total
1916—						
July	29	18	45	1	32	125
August	23	19	8	----	86	136
September	41	38	7	----	66	152
October	81	88	21	3	31	224
November	80	49	36	2	25	191
December	95	45	64	1	6	211
1917—						
January	113	45	193	----	3	353
February	149	35	107	3	3	297
March	167	38	155	4	3	367
April	130	16	173	6	1	327
May	203	37	276	4	2	522
June	96	41	165	1	----	303
Total for year	1,215	463	1,240	25	259	3,202
1917—						
July	79	56	121	1	5	262
August	30	39	81	3	21	134
September	42	59	95	6	91	293
October	157	112	134	7	26	436
November	184	78	288	4	3	557
December	283	89	465	7	2	895
1918—						
January	477	88	632	8	2	1,207
February	461	78	569	12	2	1,122
March	395	73	557	9	3	1,037
April	427	74	414	5	----	920
May	305	68	300	2	1	676
June	151	53	220	3	7	434
Total for year	3,001	866	3,855	67	162	7,961

TABLE NO. 2—STILLBIRTHS, BIRTHS AND DEATHS.

Stillbirths, Births and Deaths Reported for Calendar Years 1916 and 1917.

County	Year 1916			Year 1917		
	Still-births	*Births	*Deaths	Still-births	*Births	*Deaths
Adair	5	278	128	4	267	139
Adams	0	190	98	2	222	92
Alamakee	3	335	150	4	329	173
Appanoose	25	523	369	17	478	301
Audubon	5	303	105	3	292	74
Benton	19	441	242	6	449	222
Black Hawk	20	746	543	21	903	557
Boone	12	543	306	10	488	304
Bremer	5	170	178	6	226	171
Buchanan	3	270	317	3	309	239
Buena Vista	7	337	139	4	303	158
Butler	2	259	173	5	350	168
Calhoun	7	354	131	3	343	140
Carroll	7	464	198	8	471	194
Cass	6	337	217	9	295	198
Cedar	3	323	156	1	289	161
Cerro Gordo	21	619	332	11	697	319
Cherokee	7	339	249	4	309	202
Chickasaw	2	244	94	1	261	114
Clarke	5	174	113	4	191	95
Clay	5	256	114	4	294	101
Clayton	5	402	226	7	447	232
Clinton	14	466	479	14	506	441
Crawford	9	427	295	8	414	177
Dallas	8	428	218	7	447	247
Davis	6	227	135	6	193	127
Decatur	5	295	150	2	302	150
Delaware	7	353	213	2	332	178
Des Moines	23	575	473	20	548	468
Dickinson	1	195	69	3	215	80
Dubuque	15	703	631	14	571	611
Emmet	6	179	109	6	161	107
Fayette	12	500	259	13	488	233
Floyd	5	344	185	6	327	126
Franklin	5	248	128	5	223	136
Fremont	6	281	135	2	185	135
Greene	6	305	143	5	324	135
Grundy	4	249	75	2	277	69
Guthrie	9	321	193	6	322	136
Hamilton	6	367	161	8	353	160
Hancock	5	247	102	1	160	101
Hardin	10	372	224	2	352	179
Harrison	7	423	134	5	437	158
Henry	6	253	200	3	130	200
Howard	2	265	103	3	276	135
Humboldt	2	245	131	3	304	96
Ida	4	256	88	6	236	96
Iowa	5	252	186	1	299	146
Jackson	4	308	207		321	223
Jasper	12	544	317	15	449	312
Jefferson	5	176	187	2	276	224
Johnson	8	508	416	3	504	477
Jones	4	368	150	6	322	160
Keokuk	8	357	235	4	319	236
Kossuth	10	380	188	7	475	163
Lee	17	478	481	18	415	385

TABLE NO. 2—Continued

County	Year 1916			Year 1917		
	Still-births	*Births	*Deaths	Still-births	*Births	*Deaths
Linn	39	1,067	753	34	979	747
Louisa	4	206	126	3	189	134
Lucas	2	191	143	4	279	154
Lyon	2	356	84	1	335	93
Madison	6	239	153	4	273	149
Mahaska	13	460	279	8	428	288
Marion	2	450	328	3	372	278
Marshall	11	500	421	18	451	402
Mills	9	215	187	3	236	200
Mitchell	8	274	128	6	255	163
Monona	3	354	117	3	340	106
Monroe	6	262	256	8	290	222
Montgomery	7	358	183	4	378	198
Muscatine	17	547	379	18	429	396
O'Brien	6	354	127	4	349	135
Osceola	6	202	61	6	270	73
Page	6	332	339	9	410	307
Palo Alto	4	310	101	5	294	87
Plymouth	13	530	159	10	469	180
Pocahontas	2	225	96	4	330	108
Polk	91	1,957	1,362	79	1,968	1,705
Pottawattamie	32	818	633	40	849	696
Poweshiek	6	289	198	4	313	197
Ringgold	4	171	103	5	243	117
Sac	8	348	111	3	304	105
Scott	27	1,096	832	34	1,221	811
Shelby	3	409	130	7	372	114
Sioux	9	651	150	7	595	151
Story	15	445	254	15	444	296
Tama	3	420	225	6	365	203
Taylor	6	250	171	7	206	143
Union	4	213	200	5	220	208
Van Buren	2	201	142	5	204	161
Wapello	20	497	447	14	547	463
Warren	6	291	186	3	333	183
Washington	3	352	195	4	349	192
Wayne	8	242	161	1	254	170
Webster	9	612	341	5	703	314
Winnebago	3	256	94	1	283	85
Winneshiek	7	409	240	4	393	208
Woodbury	53	1,187	934	54	1,006	950
Worth	2	170	89	3	192	84
Wright	9	257	162	9	344	179
Total	941	39,715	23,904	816	38,294	23,779

*The figures showing births and deaths are exclusive of the stillbirths.

TABLE NO. 3—MARRIAGES AND DIVORCES.

Marriages and Divorces Reported for Fiscal Years Ending June 30, 1917 and June 30, 1918.

County	Fiscal Year 1917		Fiscal Year 1918	
	Marriages	Divorces	Marriages	Divorces
Adair	74	15	80	11
Adams	97	16	89	7
Allamakee	141	6	106	3
Appanoose	313	53	299	57
Audubon	83	8	64	4
Benton	147	31	122	21
Black Hawk	690	102	596	139
Boone	353	43	437	42
Bremer	178	6	138	13
Buchanan	165	23	164	23
Buena Vista	158	13	128	15
Butler	127	8	95	19
Calhoun	147	25	135	14
Carroll	237	18	182	14
Cass	120	32	183	22
Cedar	103	10	76	15
Cerro Gordo	423	66	401	13
Cherokee	148	13	156	13
Chickasaw	146	10	94	4
Clarke	131	6	76	15
Clay	187	14	191	11
Clayton	200	14	143	12
Clinton	546	59	494	52
Crawford	193	21	156	13
Dallas	228	30	191	29
Davis	127	10	94	17
Decatur	187	9	123	25
Delaware	166	15	148	19
Des Moines	429	59	381	39
Dickinson	84	8	95	9
Dubuque	658	24	473	35
Emmet	113	8	110	7
Fayette	217	32	172	18
Floyd	188	27	157	23
Franklin	149	7	123	11
Fremont	101	14	104	13
Greene	161	21	114	18
Grundy	119	8	92	6
Guthrie	119	24	102	14
Hamilton	182	26	167	19
Hancock	121	4	82	6
Hardin	195	24	149	21
Harrison	188	35	155	29
Henry	154	20	140	17
Howard	143	6	87	5
Humboldt	105	3	96	20
Ida	95	9	103	15
Iowa	137	6	141	3
Jackson	153	19	144	29
Jasper	249	14	197	26
Jefferson	136	8	128	21
Johnson	310	28	293	31
Jones	153	16	113	24
Keokuk	153	12	119	24
Kossuth	192	15	185	21
Lee	490	80	417	

TABLE NO. 3—Continued

County	Fiscal Year 1917		Fiscal Year 1918	
	Marriages	Divorces	Marriages	Divorces
Linn	822	172	700	153
Louisa	79	22	57	7
Lucas	158	16	146	13
Lyon	123	8	105	6
Madison	106	11	96	10
Mahaska	306	40	294	24
Marion	181	28	164	21
Marshall	291	83	229	73
Mills	139	16	119	13
Mitchell	127	14	118	7
Monona	158	17	141	18
Monroe	220	53	185	29
Montgomery	177	18	168	7
Muscatine	353	74	264	62
O'Brien	151	10	127	10
Osceola	88	6	85	4
Page	251	22	128	26
Palo Alto	121	12	111	4
Plymouth	265	21	153	5
Pocahontas	122	11	93	8
Polk	2,070	686	2,655	602
Pottawattamie	1,011	146	942	83
Poweshiek	139	24	146	19
Ringgold	96	8	96	14
Sac	154	19	127	13
Scott	869	148	857	155
Shelby	132	7	103	5
Sioux	243	8	200	19
Story	225	17	171	34
Tama	186	25	141	26
Taylor	110	32	98	18
Union	197	36	166	26
Van Buren	69	14	62	4
Wapello	491	116	456	100
Warren	189	13	151	5
Washington	122	12	122	17
Wayne	142	17	122	8
Webster	440	59	402	61
Winnebago	100	5	106	10
Winneshiek	164	4	143	9
Woodbury	1,100	232	1,068	267
Worth	84	7	82	3
Wright	178	17	133	5
Total	24,037	3,632	21,991	3,143

TABLE NO. 4—DEATHS FROM TUBERCULOSIS.

Deaths Reported in Iowa from Tuberculosis for Calendar Years 1916 and 1917.

County	1916	1917	County	1916	1917
Adair	6	2	Johnson	76	87
Adams	3	2	Jones	10	7
Allamakee	13	12	Keokuk	11	2
Appanoose	33	28	Kossuth	13	10
Audubon	4	4	Lee	30	24
Benton	16	16	Linn	55	37
Black Hawk	34	35	Louisa	8	7
Boone	23	13	Lucas	8	18
Bremer	6	6	Lyon	2	1
Buchanan	20	20	Madison	5	10
Buena Vista	4	4	Mahaska	14	16
Butler	4	9	Marion	7	13
Calhoun	6	5	Marshall	17	25
Carroll	7	8	Mills	17	10
Cass	7	7	Mitchell	6	7
Cedar	5	3	Monona	2	5
Cerro Gordo	9	15	Monroe	15	15
Cherokee	33	28	Montgomery	11	3
Chickasaw	3	5	Muscatine	25	19
Clarke	4	2	O'Brien	4	3
Clay	4	4	Osceola	3	4
Clayton	14	8	Page	15	15
Clinton	27	15	Palo Alto	8	1
Crawford	7	4	Plymouth	1	6
Dallas	12	13	Pocahontas	3	4
Davis	9	9	Polk	110	105
Decatur	11	4	Pottawattamie	30	29
Delaware	4	6	Poweshiek	13	9
Des Moines	28	34	Ringgold	3	4
Dickinson	6	4	Sac	5	5
Dubuque	41	57	Scott	75	83
Emmet	5	10	Shelby	5	5
Fayette	10	9	Sioux	1	2
Floyd	11	10	Story	14	17
Franklin	9	9	Tama	18	12
Fremont	5	7	Taylor	6	6
Greene	5	4	Union	10	10
Grundy	3	1	Van Buren	9	4
Guthrie	10	5	Wapello	27	20
Hamilton	8	9	Warren	11	7
Hancock	4	6	Washington	6	5
Hardin	13	8	Wayne	7	9
Harrison	5	4	Webster	20	18
Henry	15	27	Winnebago	11	9
Howard	9	5	Winneshiek	19	21
Humboldt	4	3	Woodbury	47	44
Ida	4	6	Worth	6	3
Iowa	9	10	Wright	4	8
Jackson	7	7			
Jasper	9	19	Total	1,398	1,339
Jefferson	11	10			

TABLE NO. 5—DEATHS IN LARGER CITIES IN IOWA.

DEATHS IN BURLINGTON, 1916 AND 1917.

(Exclusive of Stillbirths.)

Classification	1916	1917
Total for calendar year	409	408
Males	222	229
Females	187	179
White	394	399
Colored	15	9
Native	279	284
Foreign	122	113
Unknown	8	11
Single	129	122
Married	179	163
Widowed	107	112
Divorced	4	4
Unknown	8	8
Under 1 year	47	35
1 to 5 years	15	21
6 to 10 years	4	4
10 to 20 years	10	12
20 to 30 years	31	39
30 to 40 years	28	34
40 to 50 years	27	30
50 to 60 years	46	51
60 to 70 years	63	58
70 to 80 years	81	74
80 to 90 years	51	46
90 years and over	7	3
Typhoid fever	2	12
Measles	1	1
Scarlet fever		2
Whooping cough		1
Influenza	14	3
Erysipelas	1	1
Septicaemia	2	4
Tetanus		1
Tuberculosis of lungs	35	37
Tuberculous meningitis		1
Pott's disease		1
Other forms of tuberculosis	1	
Venereal diseases		4
Cancer and other malignant tumors	24	19
Rheumatism	2	1
Diabetes	6	3
Exophthalmic goitre		2
Leuhaemia	1	1
Anaemia, chlorosis	4	2
Other general diseases	4	5
Alcoholism	3	1
Simple meningitis	2	2

TABLE NO. 5—Continued

Classification	1916	1917
Locomotor ataxia	1	2
Acute anterior poliomyelitis	1	1
Cerebral hemorrhage, apoplexy	32	34
Softening of the brain	4	4
Paralysis	3	4
General paralysis of insane	1	2
Other forms of mental alienation		1
Epilepsy		1
Convulsions of infants	2	2
Neuralgia and neuritis		1
Other diseases of nervous system	3	2
Diseases of the ears	2	1
Acute endocarditis	2	1
Organic diseases of heart	44	32
Angina pectoris	3	3
Diseases of arteries, atheroma, aneurysm, etc	13	18
Embolism and thrombosis	5	4
Hemorrhage; other diseases of circulatory system	2	3
Bronchitis	5	10
Bronchopneumonia	4	4
Pneumonia	19	28
Pulmonary congestion	1	
Asthma	1	
Other diseases of respiratory system	6	3
Ulcer of stomach	1	4
Other diseases of stomach	3	2
Diarrhoea and enteritis (under 2 years)	6	2
Diarrhoea and enteritis (2 years and more)	3	4
Hernia and intestinal obstruction	5	3
Appendicitis and typhlitis	6	3
Cirrhosis of liver	4	2
Gallstones	2	
Other diseases of liver	4	6
Peritonitis	2	3
Other diseases of digestive system	2	5
Acute nephritis and Bright's disease	21	20
Diseases of the bladder		1
Diseases of prostate	2	2
Noncancerous tumors and other diseases female genital organs	4	4
Puerperal septicaemia	2	
Other puerperal diseases	1	3
Diseases of the skin and annexa		1
Diseases of bones and organs of locomotion		1
Malformations and injuries at birth	5	3
Premature birth	13	11
Congenital debility, atrophy, marasmus, etc	14	4
Other causes peculiar to early infancy	1	
Senility	15	6
Suicide	7	4
Acute accidental poisonings (except poisoning by food)	1	
Burns	1	5
Absorption of deleterious gases. Suffocation	1	2
Traumatism by fall	3	1
Traumatism by machines	2	
R. R. accidents	1	6
Automobile accidents	2	1
Injuries by other vehicles		2
Injuries by animals	1	
Excessive cold	1	
Effects of heat	3	
Other external violence	2	
Electricity (except lightning)	1	
Fractures	2	
Homicide		3
Not specified or ill-defined	3	4
Stillbirths	20	25

DEATHS IN CEDAR RAPIDS, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	503	491
Males	255	258
Females	248	233
White	496	482
Colored	7	9
Native		
Foreign	370	380
Unknown	127	103
	6	8
Single	153	153
Married	225	213
Widowed	115	118
Divorced	8	3
Unknown	2	4
Under 1 year	56	65
1 to 5 years	20	20
5 to 10 years	11	6
10 to 20 years	27	21
20 to 30 years	49	34
30 to 40 years	45	44
40 to 50 years	55	54
50 to 60 years	53	57
60 to 70 years	67	54
70 to 80 years	70	81
80 to 90 years	47	48
90 years and over	6	7
Typhoid fever	6	11
Malarial fever		
Measles	1	
Scarlet fever	3	1
Whooping cough	3	1
Diphtheria and croup		1
Influenza	5	2
Septicaemia	19	9
Tetanus	5	5
Tuberculosis of lungs	2	1
Tuberculous meningitis	23	22
Pott's disease		3
Other forms of tuberculosis	1	
Venereal diseases	7	1
Cancer and other malignant tumors	1	2
Rheumatism	41	43
Diabetes	1	3
Leucheemia	5	8
Anaemia, chlorosis	1	
Other general diseases	4	5
Alcoholism	2	1
Simple meningitis		2
Cerebrospinal meningitis	5	4
Locomotor ataxia	1	1
Cerebral hemorrhage, apoplexy	3	1
Softening of the brain	36	28
Paralysis	2	
General paralysis of insane	2	3
Epilepsy		1
Convulsions (nonpuerperal)		2

TABLE NO. 5—Continued

Classification	1916	1917
Convulsions of infants	8	1
Other diseases of nervous system	1	4
Acute endocarditis	4	3
Organic diseases of heart	42	30
Angina pectoris	11	10
Diseases of arteries, atheroma, aneurysm, etc.	4	7
Embolism and thrombosis	4	5
Hemorrhage; other diseases of circulatory system	2	1
Bronchitis	2	5
Bronchopneumonia	9	12
Pulmonary congestion		1
Pneumonia	28	32
Asthma	1	1
Other diseases of respiratory system	3	4
Ulcer of stomach	3	1
Other diseases of stomach	4	2
Diarrhoea and enteritis (under 2 years)	5	11
Diarrhoea and enteritis (2 years and more)	5	4
Appendicitis and typhlitis	12	11
Hernia and intestinal obstruction	10	11
Cirrhosis of liver	3	4
Gallstones	4	1
Other diseases of liver	6	6
Peritonitis	6	4
Other diseases of digestive system	1	3
Acute nephritis and Bright's disease	35	34
Other diseases of kidneys	2	1
Diseases of the bladder	2	1
Diseases of prostate	1	2
Noncancerous tumors and other diseases female genital organs	2	1
Puerperal septicaemia	3	1
Other puerperal diseases	4	5
Gangrene	1	
Other diseases of the skin and annexa	2	1
Diseases of bones and organs of locomotion	5	5
Malformations and injuries at birth	16	16
Premature birth	4	1
Congenital debility, atrophy, marasmus, etc.	4	3
Other causes peculiar to early infancy	10	10
Senility	8	4
Suicide		1
Acute accidental poisonings, (except poisoning by food)	2	4
Burns		2
Absorption of deleterious gases. Suffocation	11	3
Accidental drowning	1	
Traumatism by firearms	5	3
Traumatism by fall	1	3
Traumatism by machines	1	
Traumatism in mines	6	4
R. R. accidents	2	1
Street car accidents	3	4
Automobile accidents	1	
Injuries by other vehicles	1	1
Injuries by animals		
Traumatism by other crushing	2	1
Effects of heat	2	
Other external violence	1	
Electricity (except lightning)		1
Fractures		1
Homicide	2	1
Not specified or ill-defined		
Stillbirths	27	29

DEATHS IN CLINTON, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	228	215
Males	124	104
Females	104	111
White	220	209
Colored	8	6
Native	150	131
Foreign	74	81
Unknown	4	3
Single	61	55
Married	100	96
Widowed	55	37
Divorced	1	4
Unknown	2	3
Under 1 year	19	19
1 to 5 years	13	7
5 to 10 years	5	3
10 to 20 years	9	5
20 to 30 years	18	19
30 to 40 years	14	15
40 to 50 years	15	13
50 to 60 years	24	28
60 to 70 years	38	35
70 to 80 years	42	38
80 to 90 years	25	30
90 years and over	6	3
Typhoid fever	4	4
Whooping cough		1
Diphtheria and croup	1	
Influenza	4	2
Erysipelas		2
Septicaemia	1	1
Tetanus	1	1
Tuberculosis of lungs	7	9
Tuberculous meningitis	1	
Other forms of tuberculosis	4	
Venereal diseases		1
Cancer and other malignant tumors	17	20
Diabetes	2	1
Leucheamia	1	
Anaemia, chlorosis	3	
Other general diseases	1	1
Simple meningitis	1	1
Locomotor ataxia	1	
Acute anterior pollomyelitis		1
Cerebral hemorrhage, apoplexy	13	16
Softening of the brain	1	
Paralysis	3	2
General paralysis of insane		1
Convulsions of infants		2
Acute endocarditis	2	3
Other diseases of nervous system	1	
Organic diseases of heart	39	25
Angina pectoris		1
Diseases of arteries, atheroma, aneurysm, etc.	6	1
Embolism and thrombosis	1	1

TABLE NO. 5—Continued

Classification	1916	1917
Bronchitis	5	8
Bronchopneumonia	17	2
Pneumonia	3	9
Pulmonary congestion	1	1
Asthma	1	1
Other diseases of respiratory system	3	4
Diseases of stomach (except ulcer of stomach)	6	3
Diarrhoea and enteritis (under 2 years)	5	2
Diarrhoea and enteritis (2 years and more)	3	5
Appendicitis and typhlitis	3	4
Hernia and intestinal obstruction	2	3
Cirrhosis of liver	1	1
Gallstones	2	3
Peritonitis	11	11
Acute nephritis and Bright's disease	1	1
Other diseases of digestive system		1
Diseases of the bladder	1	1
Diseases of prostate		3
Noncancerous tumors and other diseases female genital organs	1	
Puerperal septicaemia	1	2
Other puerperal diseases	1	1
Gangrene		1
Other diseases of the skin and annexa	1	1
Malformations and injuries at birth	3	3
Premature birth	2	2
Congenital debility, atrophy, marasmus, etc.	1	
Other causes peculiar to early infancy	8	4
Senility	3	1
Suicide		1
Burns	2	
Absorption of deleterious gases. Suffocation	3	5
Accidental drowning	2	
Traumatism by firearms	1	1
Traumatism by fall	3	7
R. R. accidents	1	
Automobile accidents	1	
Injuries by other vehicles	1	
Injuries by animals	4	
Effects of heat	1	
Other external violence	1	1
Electricity (except lightning)		1
Fractures	3	
Homicide	3	1
Not specified or ill-defined		
Stillbirths	6	7

DEATHS IN COUNCIL BLUFFS, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	497	499
Males	255	265
Females	242	234
White	489	490
Colored	8	9
Native	382	381
Foreign	97	91
Unknown	18	27
Single	189	168
Married	180	205
Widowed	103	109
Divorced	5	3
Unknown	7	15
Under 1 year	80	68
1 to 5 years	23	19
5 to 10 years	14	12
10 to 20 years	20	24
20 to 30 years	43	36
30 to 40 years	35	40
40 to 50 years	36	62
50 to 60 years	61	48
60 to 70 years	61	67
70 to 80 years	74	73
80 to 90 years	44	41
90 years and over	6	8
Typhoid fever	3	4
Measles	1	3
Scarlet fever	10	2
Whooping cough		5
Diphtheria and croup	1	1
Influenza	5	4
Erysipelas		1
Septicaemia	3	2
Tetanus	1	1
Tuberculosis of lungs	20	15
Tuberculous meningitis	2	
Other forms of tuberculosis	3	3
Venereal diseases	4	4
Cancer and other malignant tumors	22	30
Rheumatism	4	1
Diabetes	10	7
Exophthalmic goitre	1	
Leucheamia		2
Anaemia, chlorosis		7
Other general diseases	5	
Alcoholism	2	
Simple meningitis	4	2
Cerebrospinal meningitis	2	2
Locomotor ataxia		2
Acute anterior poliomyelitis	1	1
Cerebral hemorrhage, apoplexy	29	37
Softening of the brain	1	1
Paralysis	8	2
General paralysis of insane	3	6
Other forms of mental alienation	1	2

TABLE NO. 5—Continued

Classification	1916	1917
Epilepsy	3	1
Convulsions (nonpuerperal)	1	
Convulsions of infants		1
Neuralgia and neuritis	1	
Other diseases of nervous system	5	2
Diseases of the ears		1
Acute endocarditis	2	1
Organic diseases of heart	52	60
Angina pectoris	4	7
Diseases of arteries, atheroma, aneurysm, etc	15	13
Embolism and thrombosis	11	11
Hemorrhage; other diseases of circulatory system	2	1
Bronchitis	3	1
Bronchopneumonia	6	10
Pneumonia	32	35
Pulmonary congestion	3	1
Asthma	2	
Other diseases of respiratory system	3	4
Ulcer of stomach		5
Other diseases of stomach		4
Diarrhoea and enteritis (under 2 years)	8	12
Diarrhoea and enteritis (2 years and more)	9	3
Appendicitis and typhlitis	9	10
Hernia and intestinal obstruction	13	4
Cirrhosis of liver	2	4
Gallstones		2
Other diseases of liver	2	2
Peritonitis	3	
Other diseases of digestive system	2	5
Acute nephritis and Bright's disease	27	20
Other diseases of kidneys	1	1
Diseases of prostate	1	1
Noncancerous tumors and other diseases female genital organs	3	1
Puerperal septicaemia	1	4
Other puerperal diseases	4	3
Gangrene	1	1
Diseases of bones and organs of locomotion		1
Malformations and injuries at birth	17	4
Premature birth	19	17
Congenital debility, atrophy, marasmus, etc	10	3
Other causes peculiar to early infancy	1	3
Senility	13	11
Suicide	6	5
Burns	4	3
Absorption of deleterious gases. Suffocation	2	2
Accidental drowning	2	1
Traumatism by firearms	2	1
Traumatism by cutting or piercing instruments		1
Traumatism by fall	8	3
Traumatism by machines	1	
R. R. accidents	14	12
Automobile accidents	2	3
Injuries by other vehicles		1
Injuries by animals	2	
Traumatism by other crushing	2	1
Effects of heat	2	1
Other external violence	1	
Lightning		1
Fractures	4	1
Homicide	2	7
Not specified or ill-defined	2	
Stillbirths	24	37

DEATHS IN DAVENPORT, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	735	696
Males	424	399
Females	311	297
White	720	684
Colored	15	12
Native	442	431
Foreign	275	245
Unknown	18	20
Single	244	217
Married	284	268
Widowed	185	186
Divorced	13	13
Unknown	9	17
Under 1 year	87	66
1 to 5 years	15	27
5 to 10 years	7	14
10 to 20 years	23	26
20 to 30 years	49	43
30 to 40 years	68	61
40 to 50 years	85	71
50 to 60 years	88	91
60 to 70 years	101	107
70 to 80 years	121	111
80 to 90 years	75	69
90 years and over	18	9
Unknown		1
Typhoid fever	1	5
Measles	1	2
Scarlet fever	3	2
Whooping cough		2
Diphtheria and croup	1	2
Influenza	15	4
Erysipelas	2	
Septicaemia	3	3
Tuberculosis of lungs	68	67
Tuberculous meningitis		4
Pott's disease	1	2
Other forms of tuberculosis	5	6
Venereal diseases	6	7
Cancer and other malignant tumors	52	49
Rheumatism	4	3
Diabetes	14	20
Exophthalmic goitre	1	2
Leukaemia	2	1
Anaemia, chlorosis	5	5
Other general diseases	2	4
Alcoholism	3	2
Simple meningitis	4	4
Cerebrospinal meningitis	2	1
Locomotor ataxia	2	1
Acute anterior poliomyelitis		15
Cerebral hemorrhage, apoplexy	50	53
Softening of brain		1
Paralysis	2	3
General paralysis of insane	4	1

TABLE NO. 5—Continued

Classification	1916	1917
Other forms of mental alienation	4	1
Convulsions of infants	2	
Epilepsy	2	2
Other diseases of nervous system	5	9
Diseases of the ears		2
Acute endocarditis	5	6
Organic diseases of heart	98	86
Angina pectoris	4	1
Diseases of arteries, atheroma, aneurysm, etc.	25	16
Embolism and thrombosis	10	6
Hemorrhage; other diseases of circulatory system	1	3
Bronchitis	7	15
Bronchopneumonia	11	13
Pneumonia	50	37
Pulmonary congestion	3	3
Asthma		1
Other diseases of respiratory system	3	2
Ulcer of stomach	2	1
Other diseases of stomach	4	3
Diarrhoea and enteritis (under 2 years)	12	9
Diarrhoea and enteritis (2 years and more)	3	4
Appendicitis and typhlitis	6	5
Hernia and intestinal obstruction	6	8
Cirrhosis of liver	13	4
Gallstones	7	3
Other diseases of liver	7	4
Peritonitis	8	
Other diseases of digestive system	1	1
Acute nephritis and Bright's disease	37	23
Other diseases of kidneys	6	3
Diseases of the bladder		2
Diseases of prostate		1
Noncancerous tumors and other diseases female genital organs	2	2
Puerperal septicaemia	2	3
Other puerperal diseases	3	
Gangrene	3	4
Other diseases of the skin and annexa		2
Diseases of bones and organs of locomotion		1
Malformations and injuries at birth	11	9
Premature birth	27	19
Congenital debility, atrophy, marasmus, etc.	7	6
Other causes peculiar to early infancy	5	
Senility	9	15
Suicide	19	11
Acute accidental poisonings, (except poisoning by food)	1	1
Burns	2	4
Absorption of deleterious gases. Suffocation	4	3
Accidental drowning	6	2
Traumatism by firearms		1
Traumatism by fall	1	1
Traumatism by machines	2	2
R. R. accidents	3	9
Automobile accidents	9	6
Injuries by other vehicles		3
Starvation	1	
Effects of heat	14	
Other external violence	1	2
Electricity (except lightning)		1
Fractures	1	
Homicide	2	2
Not specified or ill-defined	2	1
Deaths from all other causes		
Stillbirths	21	38

DEATHS IN DES MOINES, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	1,353	1,452
Males	732	804
Females	621	648
White	1,287	1,386
Colored	66	66
Native	1,108	1,190
Foreign	217	223
Unknown	28	39
Single	487	514
Married	549	597
Widowed	280	288
Divorced	24	29
Unknown	13	23
Under 1 year	201	185
1 to 5 years	79	93
5 to 10 years	54	51
10 to 20 years	54	71
20 to 30 years	119	123
30 to 40 years	96	114
40 to 50 years	144	132
50 to 60 years	145	200
60 to 70 years	205	192
70 to 80 years	171	199
80 to 90 years	92	109
90 years and over	13	11
Unknown		1
Typhoid fever	5	8
Smallpox		1
Measles	13	
Scarlet fever	8	4
Whooping cough	13	2
Diphtheria and croup	19	20
Influenza	24	5
Erysipelas	4	1
Septicaemia	11	13
Rabies	1	
Tetanus	2	2
Tuberculosis of lungs	60	64
Tuberculous meningitis	9	2
Pott's disease	1	1
Other forms of tuberculosis	9	10
Venereal diseases	4	15
Cancer and other malignant tumors	118	108
Rheumatism	6	3
Diabetes	13	21
Exophthalmic goitre	4	2
Leukaemia	3	2
Anaemia, chlorosis	6	12
Other general diseases	14	12
Alcoholism	4	5
Simple meningitis	6	11
Cerebrospinal meningitis	2	5
Locomotor ataxia	4	7
Acute anterior poliomyelitis	4	1
Cerebral hemorrhage, apoplexy	86	96
Softening of the brain	2	1

TABLE NO. 5—Continued

Classification	1916	1917
Paralysis	13	7
General paralysis of insane	2	2
Other forms of mental alienation		2
Epilepsy	4	4
Convulsions (nonpuerperal)	2	1
Convulsions of infants	4	4
Chorea		1
Neuralgia and neuritis	4	
Other diseases of nervous system	12	13
Diseases of the ears	2	4
Acute endocarditis	9	6
Organic diseases of heart	147	133
Angina pectoris	5	13
Diseases of arteries, atheroma, aneurysm, etc	19	25
Embolism and thrombosis	14	16
Hemorrhage; other diseases of circulatory system	1	8
Bronchitis	6	8
Bronchopneumonia	22	21
Pneumonia	81	123
Pulmonary congestion	2	3
Asthma	3	2
Other diseases of respiratory system	5	8
Ulcer of stomach	5	2
Other diseases of stomach	5	17
Diarrhoea and enteritis (under 2 years)	33	21
Diarrhoea and enteritis (2 years and more)	13	15
Appendicitis and typhlitis	25	22
Hernia and intestinal obstruction	18	18
Cirrhosis of liver	5	7
Gallstones	6	7
Other diseases of liver	10	7
Peritonitis	7	15
Other diseases of digestive system	9	6
Nephritis and Bright's disease	69	82
Other diseases of kidneys	7	3
Diseases of the bladder	4	6
Diseases of prostate	9	15
Noncancerous tumors and other diseases female genital organs	15	8
Puerperal septicaemia	11	3
Other puerperal diseases	8	14
Gangrene	4	2
Diseases of bones and organs of locomotion	2	
Malformations and injuries at birth	26	21
Premature birth	41	55
Congenital debility, atrophy, marasmus, etc	23	25
Other causes peculiar to early infancy	12	6
Senility	23	21
Suicide	20	30
Acute accidental poisonings, (except poisoning by food)	4	2
Burns	3	10
Absorption of deleterious gases. Suffocation	7	9
Accidental drowning	8	7
Traumatism by firearms	2	1
Traumatism by cutting or piercing instruments		1
Traumatism by fall	15	10
Traumatism in mines	5	11
Traumatism by machines	1	4
R. R. accidents	14	8
Street car accidents	2	2
Automobile accidents	12	19
Injuries by other vehicles	5	2
Traumatism by other crushing	3	1
Excessive cold	1	
Effects of heat		1
Other external violence	16	6
Lightning		1
Electricity (except lightning)		1
Fractures	3	2
Homicide	9	15
Not specified or ill-defined	3	9
Stillbirths	88	70

DEATHS IN DUBUQUE, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	528	496
Males	292	271
Females	236	225
White	527	494
Colored	1	2
Native	354	315
Foreign	168	171
Unknown	6	10
Single	204	184
Married	187	173
Widowed	127	126
Divorced	5	6
Unknown	5	7
Under 1 year	49	53
1 to 5 years	17	14
5 to 10 years	8	6
10 to 20 years	20	14
20 to 30 years	37	30
30 to 40 years	46	40
40 to 50 years	50	48
50 to 60 years	73	56
60 to 70 years	79	70
70 to 80 years	81	93
80 to 90 years	50	63
90 years and over	13	9
Typhoid fever	4	1
Malarial fever		1
Measles		1
Scarlet fever	3	
Whooping cough	1	2
Diphtheria and croup		7
Influenza	9	6
Erysipelas		3
Septicaemia	1	1
Tetanus	1	
Tuberculosis of lungs	35	39
Tuberculous meningitis	4	4
Other forms of tuberculosis		5
Venereal diseases	1	1
Cancer and other malignant tumors	22	36
Rheumatism	6	2
Diabetes	12	8
Exophthalmic goitre		1
Leukaemia	1	
Anaemia, chlorosis	6	3
Other general diseases	2	1
Alcoholism	1	1
Simple meningitis	7	8
Cerebrospinal meningitis	1	1
Locomotor ataxia	1	1
Acute anterior poliomyelitis		1
Cerebral hemorrhage, apoplexy	39	43
Softening of the brain	1	
Paralysis	13	6
General paralysis of insane	5	4
Other forms of mental alienation		1

TABLE NO. 5—Continued

Classification	1916	1917
Epilepsy	1	3
Convulsions of infants	1	2
Neuralgia and neuritis	1	
Other diseases of nervous system	7	2
Acute endocarditis	5	9
Organic diseases of heart	67	58
Angina pectoris	2	
Diseases of arteries, atheroma, aneurysm, etc.	7	10
Embolism and thrombosis	16	4
Bronchitis	13	7
Bronchopneumonia	33	34
Pneumonia	1	2
Pulmonary congestion	2	1
Asthma	5	6
Other diseases of respiratory system	2	4
Ulcer of stomach	5	5
Other diseases of stomach	5	4
Diarrhoea and enteritis (under 2 years)	5	5
Diarrhoea and enteritis (2 years and more)	8	5
Appendicitis and typhlitis	14	7
Hernia and intestinal obstruction	3	5
Cirrhosis of liver	2	1
Gallstones	2	1
Other diseases of liver	3	1
Peritonitis	3	1
Other diseases of digestive system	21	22
Acute nephritis and Bright's disease	1	1
Other diseases of kidneys	2	2
Diseases of the bladder	2	3
Diseases of prostate	1	
Noncancerous tumors and other diseases female genital organs	3	1
Puerperal septicaemia	4	5
Other puerperal diseases	1	1
Gangrene	4	1
Other diseases of the skin and annexa	9	13
Diseases of bones and organs of locomotion	13	11
Malformations and injuries at birth	3	2
Premature birth	1	1
Congenital debility, atrophy, marasmus, etc.	9	17
Other causes peculiar to early infancy	2	1
Senility	1	3
Suicide	1	
Burns	1	
Poisoning by food, accident	4	3
Absorption of deleterious gases. Suffocation	1	
Accidental drowning	2	7
Traumatism by firearms	1	1
Traumatism by fall	7	5
Traumatism in mines	4	7
Traumatism by machines	1	
Automobile accidents	10	
R. R. accidents	2	4
Excessive cold	4	
Effects of heat	2	
Other external violence	16	14
Fractures		
Not specified or ill-defined		
Stillbirths		

DEATHS IN FORT DODGE, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	200	198
Males	111	100
Females	89	98
White	195	194
Colored	5	4
Native	148	133
Foreign	50	63
Unknown	2	2
Single	75	69
Married	81	82
Widowed	39	41
Divorced	1	
Unknown	5	5
Under 1 years	28	30
1 to 5 years	13	12
5 to 10 years	7	1
10 to 20 years	5	5
20 to 30 years	19	14
30 to 40 years	10	24
40 to 50 years	18	18
50 to 60 years	19	21
60 to 70 years	24	20
70 to 80 years	23	30
80 to 90 years	17	13
90 years and over	8	4
Typhoid fever	1	3
Measles	2	
Scarlet fever	1	
Whooping cough		2
Diphtheria and croup	1	2
Influenza	3	
Septicaemia	5	5
Tuberculosis of lungs	17	12
Other forms of tuberculosis		1
Venereal diseases	2	
Cancer and other malignant tumors	11	13
Rheumatism	1	2
Diabetes	1	1
Leucheamia		1
Anaemia, chlorosis	2	2
Other general diseases	2	1
Alcoholism	2	2
Cerebral hemorrhage, apoplexy	14	14
Paralysis	2	1
Mental alienation		1
Epilepsy	1	
Other diseases of nervous system	1	1
Acute endocarditis		1
Organic diseases of heart	15	13
Angina pectoris	2	
Diseases of arteries, atheroma, aneurysm, etc.		2
Embolism and thrombosis	1	1
Hemorrhage; other diseases of circulatory system	1	2
Bronchitis	2	1
Bronchopneumonia	9	2
Pneumonia	35	34

TABLE NO. 5—Continued

Classification	1916	1917
Pulmonary congestion	1	2
Asthma		2
Other diseases of respiratory system	2	2
Diseases of stomach (except ulcer of stomach)	2	2
Diarrhoea and enteritis (under 2 years)	5	6
Diarrhoea and enteritis (2 years and more)	1	
Appendicitis and typhlitis	3	4
Hernia and intestinal obstruction	2	4
Cirrhosis of liver	1	1
Gallstones	1	
Other diseases of liver		2
Peritonitis		2
Other diseases of digestive system	1	1
Acute nephritis and Bright's disease	8	9
Other diseases of kidneys	1	1
Noncancerous tumors and other diseases female genital organs		1
Puerperal septicaemia	1	2
Other puerperal diseases	3	1
Gangrene	2	1
Diseases of bones and organs of locomotion	1	1
Malformations and injuries at birth	1	1
Premature birth	6	4
Congenital debility, atrophy, marasmus, etc	1	6
Other causes peculiar to early infancy		2
Senility	7	10
Suicide	5	3
Burns	1	
Absorption of deleterious gases. Suffocation	1	
Accidental drowning	2	2
Traumatism by firearms	1	
Traumatism by fall	1	
Traumatism in mines	1	
Traumatism by machines	1	
R. R. accidents	3	3
Automobile accidents	3	1
Injuries by other vehicles		1
Traumatism by other crushing	1	
Other external violence	1	
Electricity (except lightning)	1	
Homicide		3
Not specified or ill-defined		6
Stillbirths	6	4

DEATHS IN KEOKUK, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	234	224
Males	123	119
Females	111	105
White	215	208
Colored	19	16
Native	179	175
Foreign	51	43
Unknown	4	6
Single	68	68
Married	88	87
Widowed	74	62
Divorced	3	1
Unknown	1	5
Under 1 year	18	17
1 to 5 years	8	7
5 to 10 years	4	2
10 to 20 years	6	7
20 to 30 years	14	7
30 to 40 years	22	12
40 to 50 years	24	21
50 to 60 years	37	20
60 to 70 years	34	36
70 to 80 years	41	60
80 to 90 years	30	22
90 years and over	6	3
Typhoid fever	3	1
Measles		2
Scarlet fever		1
Diphtheria and croup	1	
Influenza	3	3
Septicaemia		2
Tuberculosis of lungs	17	11
Other forms of tuberculosis	5	1
Venereal diseases		1
Cancer and other malignant tumors	14	12
Rheumatism	1	1
Diabetes	2	2
Exophthalmic goitre		1
Anaemia, chlorosis	1	1
Other general diseases	3	2
Alcoholism	1	1
Simple meningitis	1	1
Cerebral hemorrhage, apoplexy	30	15
Softening of the brain		1
Paralysis	2	6
General paralysis of insane		4
Other forms of mental alienation		2
Epilepsy		1
Convulsions of infants	1	1
Neuralgia and neuritis	5	2
Other diseases of nervous system	1	
Diseases of the ears	1	2
Acute endocarditis	30	29
Organic diseases of heart	3	
Angina pectoris		

TABLE NO. 5—Continued

Classification	1916	1917
Pulmonary congestion	1	1
Asthma		3
Other diseases of respiratory system	2	1
Diseases of stomach (except ulcer of stomach)	3	3
Diarrhoea and enteritis (under 2 years)	5	6
Diarrhoea and enteritis (2 years and more)	3	
Appendicitis and typhlitis	3	4
Hernia and intestinal obstruction	2	4
Cirrhosis of liver	1	1
Gallstones	1	
Other diseases of liver		2
Peritonitis		2
Other diseases of digestive system	1	1
Acute nephritis and bright's disease	8	9
Other diseases of kidneys	1	1
Noncancerous tumors and other diseases female genital organs		1
Puerperal septicaemia	1	2
Other puerperal diseases	3	1
Gangrene	2	1
Diseases of bones and organs of locomotion	1	1
Malformations and injuries at birth	2	2
Premature birth	6	4
Congenital debility, atrophy, marasmus, etc	1	3
Other causes peculiar to early infancy		2
Senility	7	10
Suicide	3	3
Burns	1	
Absorption of deleterious gases. Suffocation	1	
Accidental drowning	2	2
Traumatism by firearms	1	
Traumatism by fall	1	
Traumatism in mines	1	
Traumatism by machines	1	
R. R. accidents	3	1
Automobile accidents	2	2
Injuries by other vehicles		1
Traumatism by other crushing	1	
Other external violence	1	
Electricity (except lightning)	1	
Homicide		2
Not specified or ill-defined		6
Stillbirths	6	4

DEATHS IN KEOKUK, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	234	224
Males	123	119
Females	111	105
White	215	208
Colored	19	16
Native	179	175
Foreign	51	43
Unknown	4	6
Single	68	68
Married	88	87
Widowed	74	62
Divorced	3	1
Unknown	1	5
Under 1 year	18	17
1 to 5 years	8	7
5 to 10 years	4	2
10 to 20 years	6	7
20 to 30 years	14	7
30 to 40 years	22	12
40 to 50 years	24	21
50 to 60 years	27	30
60 to 70 years	24	30
70 to 80 years	41	60
80 to 90 years	30	22
90 years and over	6	3
Typhoid fever	3	1
Measles		0
Scarlet fever		1
Diphtheria and croup	1	
Influenza	3	3
Septicaemia		2
Tuberculosis of lungs	17	11
Other forms of tuberculosis	5	1
Venereal diseases		1
Cancer and other malignant tumors	14	17
Rheumatism	1	1
Diabetes	2	2
Exophthalmic goitre		1
Anaemia, chlorosis	1	1
Other general diseases	2	2
Alcoholism	1	1
Simple meningitis	1	1
Cerebral hemorrhage, apoplexy	20	15
Softening of the brain		1
Paralysis	2	8
General paralysis of insane		4
Other forms of mental alienation		2
Epilepsy		1
Convulsions of infants	1	
Neuralgia and neuritis		1
Other diseases of nervous system	5	2
Diseases of the ears	1	
Acute endocarditis	1	2
Organic diseases of heart	30	29
Angina pectoris	2	

TABLE NO. 5—Continued

Classification	1916	1917
Angina pectoris	3	1
Diseases of arteries, atheromas, aneurysm, etc.	1	5
Embolism and thrombosis	1	1
Hemorrhage; other diseases of circulatory system	1	1
Bronchitis		5
Bronchopneumonia	2	5
Pneumonia	9	31
Pulmonary congestion		1
Asthma	1	3
Other diseases of respiratory system		2
Ulcer of stomach	1	2
Other diseases of stomach	4	3
Diarrhoea and enteritis (under 2 years)	8	6
Diarrhoea and enteritis (2 years and more)	4	3
Appendicitis and typhlitis	11	7
Hernia and intestinal obstruction		4
Cirrhosis of liver	1	4
Gallstones	2	1
Other diseases of liver	4	3
Peritonitis	2	1
Other diseases of digestive system	1	
Acute nephritis and Bright's disease	26	29
Diseases of the bladder	1	2
Diseases of prostate	1	3
Noncancerous tumors and other diseases female genital organs	3	2
Puerperal septicaemia		3
Other puerperal diseases	1	2
Gangrene	3	4
Other diseases of the skin and annexa		1
Diseases of bones and organs of locomotion	1	
Malformations and injuries at birth		2
Premature birth	2	5
Congenital debility, atrophy, marasmus, etc.	3	4
Senility	8	16
Suicide	1	2
Traumatism by fall	1	
Traumatism in mines	1	
Traumatism by machines	1	1
R. R. accidents	2	1
Street car accidents		1
Automobile accidents	3	4
Injuries by other vehicles	1	
Other external violence	1	
Electricity (except lightning)		1
Homicide	1	
Not specified or ill-defined	2	3
Stillbirths	6	15

DEATHS IN MASON CITY, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	206	223
Males	120	142
Females	86	81
White	203	215
Colored	3	8
Native	157	180
Foreign	49	42
Unknown		1
Single	92	83
Married	77	90
Widowed	33	48
Divorced	3	5
Unknown	1	2
Under 1 year	38	45
1 to 5 years	17	13
5 to 10 years	8	3
10 to 20 years	7	8
20 to 30 years	17	23
30 to 40 years	18	15
40 to 50 years	14	22
50 to 60 years	18	23
60 to 70 years	26	15
70 to 80 years	28	31
80 to 90 years	14	22
90 years and over	1	3
Typhoid fever	4	1
Measles	2	1
Scarlet fever	2	
Whooping cough	1	
Diphtheria and croup	4	2
Influenza	4	
Erysipelas	1	1
Septicaemia	2	5
Tuberculosis of lungs	5	6
Tuberculous meningitis		3
Other forms of tuberculosis		3
Cancer and other malignant tumors	17	14
Rheumatism	1	1
Diabetes	4	3
Leuchaemia	1	
Anaemia, chlorosis	2	1
Other general diseases	1	1
Simple meningitis	1	1
Cerebrospinal meningitis	1	1
Cerebral hemorrhage, apoplexy	15	12
Paralysis		1
Epilepsy		1
Convulsions of infants	1	
Neuralgia and neuritis	1	1
Other diseases of nervous system	1	3
Diseases of the ears	1	1
Acute endocarditis	1	1
Organic diseases of heart	22	18
Angina pectoris		2
Diseases of arteries, atheroma, aneurysm, etc.	4	3

TABLE NO. 5—Continued

Classification	1916	1917
Embolism and thrombosis		1
Bronchitis		2
Bronchopneumonia	1	
Pneumonia	14	15
Pulmonary congestion	1	1
Asthma	1	1
Other diseases of respiratory system		1
Ulcer of stomach		1
Other diseases of stomach	4	2
Diarrhoea and enteritis (under 2 years)	8	10
Diarrhoea and enteritis (2 years and more)	4	1
Appendicitis and typhlitis	2	4
Hernia and intestinal obstruction	5	4
Cirrhosis of liver		1
Gallstones	1	1
Other diseases of liver	2	
Peritonitis	1	2
Other diseases of digestive system	2	2
Acute nephritis and Bright's disease	12	18
Other diseases of kidneys	1	
Diseases of bladder		1
Diseases of prostate		1
Noncancerous tumors and other diseases female genital organs		1
Puerperal septicaemia	1	1
Other puerperal diseases	2	1
Malformations and injuries at birth	3	3
Diseases of bones and organs of locomotion	2	1
Gangrene		1
Premature birth	15	10
Congenital debility, atrophy, marasmus, etc.	2	2
Other causes peculiar to early infancy		2
Senility	1	2
Suicide	2	
Acute accidental poisonings (except poisoning by food)	1	
Burns	2	1
Absorption of deleterious gases. Suffocation	1	1
Accidental drowning	3	
Traumatism by firearms		1
Traumatism by fall	1	3
Traumatism by machines		1
R. R. accidents	1	3
Automobile accidents	2	1
Injuries by other vehicles		1
Traumatism by other crushing	2	
Other external violence	1	2
Electricity (except lightning)	2	
Homicide	1	1
Not specified or ill-defined	2	1
Stillbirths	21	19

DEATHS IN MUSCATINE, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	261	292
Males	143	159
Females	118	133
White	261	286
Colored		6
Native	193	227
Foreign	68	63
Unknown	1	2
Single	77	87
Married	118	131
Widowed	65	67
Divorced		5
Unknown	1	2
Under 1 year	23	31
1 to 5 years	11	14
5 to 10 years	5	7
10 to 20 years	13	11
20 to 30 years	20	14
30 to 40 years	13	17
40 to 50 years	19	29
50 to 60 years	30	41
60 to 70 years	46	50
70 to 80 years	51	43
80 to 90 years	26	30
90 years and over		3
Typhoid fever		1
Measles		10
Influenza	10	2
Septicaemia	4	2
Tetanus	2	
Tuberculosis of lungs	16	9
Tuberculous meningitis	3	1
Pott's disease	1	1
Other forms of tuberculosis		4
Venereal diseases		1
Cancer and other malignant tumors	16	13
Diabetes	1	6
Exophthalmic goitre	2	
Leucheamia	1	1
Anaemia, chlorosis		1
Other general diseases		4
Simple meningitis	1	1
Locomotor ataxia		2
Cerebral hemorrhage, apoplexy	23	25
Paralysis	2	2
General paralysis of insane		2
Epilepsy		1
Convulsions of infants	1	1
Neuralgia and neuritis	1	
Other diseases of nervous system	8	5
Diseases of ears	1	
Acute endocarditis	1	3
Organic diseases of heart	29	29
Diseases of arteries, atheroma, aneurysm, etc.	5	2
Embolism and thrombosis		1

TABLE NO. 5—Continued

Classification	1916	1917
Hemorrhage; other diseases of circulatory system	3	
Bronchitis	4	4
Bronchopneumonia	2	2
Pneumonia	16	21
Pulmonary congestion	2	1
Ulcer of stomach	1	
Other diseases of stomach	1	1
Diarrhoea and enteritis (under 2 years)	2	8
Diarrhoea and enteritis (2 years and more)	3	5
Appendicitis and typhilitis	12	3
Hernia and intestinal obstruction	2	5
Cirrhosis of liver	3	5
Gallstones		2
Other diseases of liver	3	2
Peritonitis		1
Other diseases of digestive system		1
Acute nephritis and Bright's disease	19	21
Other diseases of kidneys		1
Diseases of the bladder		1
Diseases of prostate	4	2
Noncancerous tumors and other diseases female genital organs	1	1
Puerperal septicaemia	2	
Other puerperal diseases	1	3
Gangrene	2	2
Other diseases of the skin and annexa		1
Malformations and injuries at birth	5	
Premature birth	1	13
Congenital debility, atrophy, marasmus, etc	4	2
Other causes peculiar to early infancy	1	1
Senility	14	14
Suicide	5	3
Acute accidental poisonings, (except poisoning by food)	1	
Burns	1	
Absorption of deleterious gases. Suffocation		5
Accidental drowning	4	1
Traumatism by firearms		1
Traumatism by fall	2	2
R. R. accidents	4	5
Automobile accidents		1
Injuries by other vehicles	1	3
Effects of heat	1	
Injuries by animals	1	
Other external violence	1	
Fractures		1
Not specified or ill-defined	2	4
Stillbirths	13	15

DEATHS IN OTTUMWA, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	300	345
Males	147	189
Females	153	156
White	291	331
Colored	9	14
Native	256	287
Foreign	41	50
Unknown	3	8
Single	102	104
Married	133	149
Widowed	63	79
Divorced	5	9
Unknown	7	13
Under 1 year	50	50
1 to 5 years	14	18
5 to 10 years	4	6
10 to 20 years	11	14
20 to 30 years	24	20
30 to 40 years	21	24
40 to 50 years	22	38
50 to 60 years	31	43
60 to 70 years	36	53
70 to 80 years	60	51
80 to 90 years	23	22
90 years and over	4	16
Typhoid fever	2	2
Malarial fever		
Measles	1	
Diphtheria and croup		1
Influenza	4	4
Erysipelas	7	
Septicaemia	4	9
Tuberculosis of lungs	25	28
Tuberculous meningitis	1	1
Pott's disease	1	
Venereal diseases	1	
Other forms of tuberculosis	2	5
Cancer and other malignant tumors	24	14
Rheumatism	1	3
Diabetes	2	4
Exophthalmic goitre	1	1
Leucheamia		1
Anaemia, chlorosis	1	4
Other general diseases	6	1
Alcoholism	1	2
Simple meningitis	2	6
Locomotor ataxia	3	1
Cerebral hemorrhage, apoplexy	9	18
Paralysis	2	3
General paralysis of insane	2	
Epilepsy		1
Chorea		1
Other diseases of nervous system	2	7
Diseases of the ears	1	
Acute endocarditis	1	2

TABLE NO. 5—Continued

Classification	1916	1917
Organic diseases of heart	18	17
Angina pectoris	1	2
Diseases of arteries, atheroma, aneurysm, etc.	8	8
Embolism and thrombosis	1	1
Hemorrhage; other diseases of circulatory system	2	1
Bronchitis	1	1
Bronchopneumonia	8	7
Pneumonia	20	19
Asthma	2	1
Other diseases of respiratory system	1	2
Ulcer of stomach	2	4
Other diseases of stomach		1
Diarrhoea and enteritis (under 2 years)	6	3
Diarrhoea and enteritis (2 years and more)	7	5
Appendicitis and typhlitis	6	7
Hernia and intestinal obstruction	6	4
Cirrhosis of liver		1
Gallstones	1	2
Other diseases of liver	1	2
Peritonitis	3	4
Other diseases of digestive system	2	4
Acute nephritis and Bright's disease	18	28
Other diseases of kidneys	1	
Diseases of the bladder	2	1
Diseases of prostate	2	2
Noncancerous tumors and other diseases of female genital organs	1	
Puerperal septicaemia		2
Other puerperal diseases	2	
Gangrene		1
Diseases of bones and organs of locomotion	2	
Malformations and injuries at birth	5	2
Premature birth	11	10
Congenital debility, atrophy, marasmus, etc.	11	5
Other causes peculiar to early infancy	5	8
Senility	15	12
Suicide	4	6
Burns	1	2
Absorption of deleterious gases. Suffocation		1
Accidental drowning	2	2
Traumatism by firearms		2
Traumatism by fall	2	
Traumatism in mines	1	2
Traumatism by machines	1	
R. R. accidents	3	3
Automobile accidents	5	4
Fractures	1	2
Homicide	2	1
Not specified or ill-defined	5	4
Stillbirths	16	9

DEATHS IN SIOUX CITY, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	775	791
Males	418	455
Females	357	336
White	766	781
Colored	9	10
Native	370	537
Foreign	181	214
Unknown	24	40
Single	319	313
Married	316	335
Widowed	119	123
Divorced	6	10
Unknown	15	20
Under 1 year	122	106
1 to 5 years	58	51
5 to 10 years	33	26
10 to 20 years	40	28
20 to 30 years	78	79
30 to 40 years	74	85
40 to 50 years	68	77
50 to 60 years	99	102
60 to 70 years	96	108
70 to 80 years	79	72
80 to 90 years	28	53
90 years and over	8	4
Unknown	2	
Typhoid fever	3	1
Measles	11	
Scarlet fever	2	6
Whooping cough	1	3
Diphtheria and croup	10	5
Influenza	9	2
Erysipelas	4	6
Septicaemia	7	9
Tetanus	1	1
Tuberculosis of lungs	33	33
Tuberculous meningitis	2	6
Pott's disease	1	1
Other forms of tuberculosis	3	4
Venereal diseases	8	4
Cancer and other malignant tumors	62	69
Rheumatism	2	3
Diabetes	13	10
Exophthalmic goitre	1	2
Leucheamia	2	1
Anaemia, chlorosis	2	2
Other general diseases	3	2
Alcoholism	2	3
Simple meningitis	5	8
Cerebrospinal meningitis	1	4
Acute anterior poliomyelitis		2
Cerebral hemorrhage, apoplexy	27	45
Paralysis	5	7
General paralysis of insane	2	2
Epilepsy		1
Convulsions (nonpuerperal)		1

TABLE NO. 5—Continued

Classification	1916	1917
Convulsions of infants	2	2
Other diseases of nervous system	7	7
Diseases of the ears	2	1
Acute endocarditis	5	3
Organic diseases of heart	48	66
Angina pectoris	2	2
Diseases of arteries, atheroma, aneurysm, etc.	11	11
Embolism and thrombosis	9	9
Hemorrhage; other diseases of circulatory system	2	5
Bronchitis	6	2
Bronchopneumonia	18	31
Pneumonia	65	76
Pulmonary congestion	1	
Asthma	2	2
Other diseases of respiratory system	4	4
Ulcer of stomach	8	7
Other diseases of stomach	4	10
Diarrhoea and enteritis (under 2 years)	32	10
Diarrhoea and enteritis (2 years and more)	11	6
Appendicitis and typhlitis	31	20
Hernia and intestinal obstruction	22	18
Cirrhosis of liver	4	4
Gallstones	2	3
Other diseases of liver	7	10
Peritonitis	9	9
Other diseases of digestive system	9	10
Acute nephritis and Bright's disease	43	66
Other diseases of kidneys	3	3
Diseases of the bladder	1	1
Diseases of prostate	3	4
Noncancerous tumors and other diseases of female genital organs	4	3
Puerperal septicaemia	4	4
Other puerperal diseases	7	2
Gangrene	1	1
Other diseases of the skin and annexa	1	1
Malformations and injuries at birth	8	9
Diseases of bones and organs of locomotion	6	2
Premature birth	25	28
Congenital debility, atrophy, marasmus, etc.	22	12
Other causes peculiar to early infancy	3	6
Senility	21	30
Suicide	8	13
Acute accidental poisonings, (except poisoning by food)	2	3
Burns	3	3
Absorption of deleterious gases. Suffocation	7	10
Accidental drowning	5	3
Traumatism by firearms	2	1
Traumatism by fall	13	9
Traumatism by machines		2
R. R. accidents	10	6
Street car accidents		2
Automobile accidents	9	7
Injuries by other vehicles	1	4
Injuries by animals	2	1
Traumatism by other crushing		1
Excessive cold	2	1
Effects of heat	1	3
Other external violence	4	3
Electricity (except lightning)	1	
Fractures	2	1
Homicide	3	3
Not specified or ill-defined	22	7
Deaths from all other causes		2
Stillbirths	42	42

DEATHS IN WATERLOO, 1916 AND 1917.

(Exclusive of Stillbirths.)

TABLE NO. 5—Continued

Classification	1916	1917
Total for calendar year	344	349
Males	177	200
Females	167	149
White	344	347
Colored		2
Native	273	294
Foreign	62	48
Unknown	7	7
Single	121	108
Married	134	170
Widowed	79	61
Divorced	5	9
Unknown	5	1
Under 1 year	53	49
1 to 5 years	7	15
5 to 10 years	3	9
10 to 20 years	18	11
20 to 30 years	26	20
30 to 40 years	34	32
40 to 50 years	33	31
50 to 60 years	47	40
60 to 70 years	34	50
70 to 80 years	47	44
80 to 90 years	35	32
90 years and over	7	6
Typhoid fever	5	2
Scarlet fever	3	2
Whooping cough		5
Diphtheria and croup	1	2
Influenza	47	44
Erysipelas	0	1
Septicaemia	1	
Tetanus	1	2
Tuberculosis of lungs	2	2
Tuberculous meningitis	16	18
Pott's disease	2	3
Other forms of tuberculosis	2	1
Venereal diseases		3
Cancer and other malignant tumors	1	2
Rheumatism	26	31
Diabetes	3	4
Exophthalmic goitre	5	6
Leuchaemia	1	1
Anaemia, chlorosis	2	
Other general diseases	5	4
Alcoholism		1
Simple meningitis	2	
Cerebrospinal meningitis	1	2
Locomotor ataxia	1	1
Acute anterior poliomyelitis	1	1
Cerebral hemorrhage, apoplexy	30	20
Paralysis	2	4
General paralysis of insane	2	1
Other forms of mental alienation		1
Convulsions of infants	1	

TABLE NO. 5—Continued

Classification	1916	1917
Chorea		1
Other diseases of nervous system	5	4
Diseases of the ears		1
Acute endocarditis	5	3
Organic diseases of heart	22	24
Angina pectoris	1	2
Diseases of arteries, atheroma, aneurysm, etc.	7	4
Embolism and thrombosis	3	2
Hemorrhage; other diseases of circulatory system	1	
Bronchitis	2	2
Bronchopneumonia	9	6
Pneumonia	23	21
Pulmonary congestion	1	
Asthma	1	
Other diseases of respiratory system	7	4
Ulcer of stomach	1	3
Other diseases of stomach	1	
Diarrhoea and enteritis (under 2 years)	6	3
Diarrhoea and enteritis (2 years and more)	1	
Appendicitis and typhlitis	9	9
Hernia and intestinal obstruction	3	7
Cirrhosis of liver		1
Gallstones	3	1
Other diseases of liver	2	
Peritonitis	2	1
Other diseases of digestive system	1	4
Acute nephritis and Bright's disease	23	32
Diseases of the bladder		1
Diseases of prostate	3	
Noncancerous tumors and other diseases female genital organs	5	3
Puerperal septicaemia		2
Other puerperal diseases	3	4
Diseases of bones and organs of locomotion	1	1
Malformations and injuries at birth	8	7
Premature birth	23	19
Congenital debility, atrophy, marasmus, etc.	4	5
Other causes peculiar to early infancy	3	3
Senility	6	4
Suicide	5	4
Acute accidental poisonings, (except poisoning by food)	1	1
Burns		2
Absorption of deleterious gases. Suffocation	1	1
Accidental drowning	2	1
Traumatism by firearms		2
Traumatism by fall	1	5
Traumatism by machines		2
R. R. accidents	1	2
Street car accidents	1	1
Automobile accidents	2	1
Traumatism by other crushing		1
Effects of heat	1	
Other external violence	2	2
Fractures	2	1
Homicide	3	2
Not specified or ill-defined	2	
Stillbirths	14	15

SANITATION

Report of the Civil and Sanitary Engineer for the Biennium.

LAFAYETTE HIGGINS.

Engineer Member of the Board.

Field Investigations—

Field trips and sanitary surveys relating to installation of water supply, sewerage and sewage disposal, garbage disposal, and inspection and supervision of existing water supply systems and sewage treatment plants.

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. This work 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. During the summer of 1917 Prof. J. H. Dunlap, of the State University, was employed by the State Board of Health to assist in this work.

FIELD TRIPS AND INVESTIGATIONS.

MADE BY THE SANITARY ENGINEER.

Places Investigated, Population and the Purpose of the Investigation.

Afton, 1,007. (Feb. 9, 1917) Sanitary survey and conference with the town council relative to the installation of a sanitary sewer system.

Audubon, 2,084. (April 24, 1918) Investigated sewage treatment plants and held conference with city council relative to improving the same.

Boone, 12,253. (July 23, 1917) Conference with city council to consider the installation of a sewage treatment plant.

Calmar, 952. (June 19, 1918) Sanitary survey and conference with town council relative to the reconstruction and completion of the sewage treatment plant and the extension of the sanitary sewer system.

Clarinda, 4,478. (Jan. 18, 1918) Conference with city council relative to the location of a new source for a public water supply and the proper methods of treatment of the public water supply.

Creston, 7,572. (Feb. 19, 1917) Conference with the city council and city engineer relative to the location of a sewage treatment plant and the designing of the same.

Ft. Dodge, 19,372. (Dec. 10, 1917) Sanitary survey to determine pollution of the Des Moines River where the Ft. Dodge ice fields are located, and to determine necessary measures for removing the sources of pollution.

George, 704. (July 13, 1917) Sanitary survey and conference with the town council and citizens relative to the installation of a sanitary sewer system.

Gilmore City, 935. (July 11, 1917) Sanitary survey and conference with the town council relative to the installation of a sanitary sewer system.

Graettinger, 743. (July 16, 1917) Sanitary survey to determine pollution of water supply and conference with the town council and citizens relative to the installation of a sanitary sewer system.

High Bridge, 300, Mining town. (April 10, 1918) Sanitary survey and investigation of water supply and disposal of night soil and refuse.

Indianola, 3,495. (Jan. 24, Apr. 17, 1917) Consultation with city council relative to the installation of new filter beds at sewage treatment plant.

Laurens, 848. (May 14, June 14, 1918) Conference with town council relative to installation of a sanitary sewer system and adoption of resolutions of necessity ordering the same.

Marcus, 987. (July 12, 1917) Sanitary survey and conference with town council relative to the installation of a sanitary sewer system.

Melcher, 1,500. (April 22, 1918) Sanitary survey and conference with town council relative to the installation of a public water supply and a sanitary sewer system.

Milford, 823. (Feb. 14, 15, 1917) Sanitary survey and conference with the town council and citizens relative to the installation of a sanitary sewer system.

Montezuma, 1,326. (Sept. 28, 1917, June 12, 1918) Investigation relative to proper location of proposed sewage treatment plant and conference with the town council relative to the installation of said plant.

Newton, 5,165. (Oct. 4, Dec. 1, 23, 1916) Investigation of unsanitary conditions and consultation relative to completing the sewerage of the city and the installation of sewage treatment plants, and providing for a complete sanitary survey of the city.

Osage, 2,779. (Mar. 7, 1918) Consultation with the city council relative to the proposed installation of a sanitary sewer system.

Rexton, Mining Town. (Jan. 22, 1918) Consultation with township trustees to determine methods of securing a sufficient and satisfactory water supply for the mining town.

Rock Valley, 1,306. (Dec. 5, 6, 7, 1916) Sanitary survey and conference with the town council and citizens relative to the installation of a sanitary sewer system.

Rolfe, 1,115. (Feb. 16, 1917) Conference with town council and citizens relative to the installation of a sanitary sewer system.

Seymour, 2,146. (June 22, 1917) Conference with the city council and citizens relative to a sanitary survey and the installation of a sanitary sewer system.

Story City, 1,576. (June 14, 1917) Sanitary survey to determine pollution of public water supply and conference with the town council and citizens relative to the installation of a sanitary sewer system.

Tipton, 2,176. (May 22, 1918) Conference with Board of Education relative to disposal of school sewage.

Ward, Mining Town. (Jan. 22, 1918) Consultation with township trustees to determine methods of securing a sufficient and satisfactory water supply for the mining town.

Wilton, 1,176. (Jan. 17, 1916) Consultation with town council relative to the installation of a sanitary sewer system.

Winterset, 2,860. (June 7, 1918) Investigating sewage disposal by open sewer ditch within city limits.

Woodward, 820. (June 10, 1918) Assisted the town council in choosing location for sewage treatment plant.

CO-OPERATIVE SERVICE.

Acting under the resolution passed by the State Board of Health, January 13, 1914, the State Board of Health has, so far as possible, cooperated with the Engineering Departments of the Iowa State College and the Iowa State University in field and laboratory services relative to the installation of public water supplies, sanitary sewer systems, sewage treatment plants, and garbage and refuse disposal.

The services rendered by the State University are recorded in the reports of the State Board of Health Laboratories, which are located at the State University.

The services rendered by the Technical Service Bureau of the Iowa State College in the Engineering Extension Department during the biennial period closing June 30, 1918, are here included.

July 19, 1918.

Mr. Lafayette Higgins, Sanitary Engineer,
State Board of Health,
Des Moines, Iowa.

Dear Mr. Higgins:

I am enclosing herewith, a brief outline of the work done by the Technical Service Bureau in the past two years in cooperation with the State Board of Health. Very truly yours,

(Signed) D. C. Faber,
Industrial Engineer.

REPORT OF PROF. D. C. FABER.

Aplington—Information relative to the installation of private sewage disposal plants was furnished to the city council on request. The general method of handling the sewerage situation in small towns was considered and the uses and limitations of private plants in this connection were discussed and experimental data furnished.

Aurelia—Information on private sewage disposal plants was furnished the council on request. The uses and limitations of such plants in municipal service were discussed and experimental data were furnished.

Blanchard—Information relative to the installation of private sewage disposal plants was furnished school board on request. General methods of sewerage disposal were considered and the uses and limitations of private plants were discussed and experimental data were furnished.

Calumet—Information was requested relative to the installation of sewers and sewage disposal plants. General methods of financing sewers and information regarding cost of such systems in other communities were furnished. The necessity for sewers and sewage disposal plants was also considered.

Cherokee—Information relative to the installation of private sewage treatment plant was furnished the school board. The general method of handling sewage, also cost and experimental data furnished.

Coggon—Visited by D. C. Faber at the request of mayor and town council for the purpose of discussing the possibility of improvements in water storage facilities. The advantages of various types of reservoirs were discussed.

College Springs—Information relative to the installation of private sewage treatment plant was furnished the school board. The general method of handling sewage, also cost and limitation of private plants was discussed and experimental data furnished.

Essex—Information was requested relative to water supply. The general subject of water supplies was discussed. Information was furnished relative to the costs of waterworks plants in other towns. Statistical information showing water rates in other communities was furnished. The advisability of employing an engineer was discussed.

Fayette—Visited by D. C. Faber at the request of engineer and city council for discussing sewerage systems and sewage disposal plants. The necessity and desirability of sewers and sewage disposal plants was discussed with the council and at a public meeting.

Fredericksburg—Information relative to ordinances regulating plumbing and sewer connections was requested by the town council. Ordinances regulating installation of plumbing and sewer connections and inspection of the same, were discussed and assistance given in framing an ordinance for Fredericksburg.

Gilman—Information requested relative to sewer construction. Visited by D. C. Faber for purpose of supplying information relative to construction of sewers and sewage disposal plant. At a council meeting and public meeting, the necessity for sewers was discussed, methods of financing such systems and the powers of the council and cost of similar installations in other towns were explained. The employment of an engineer was recommended.

Graettinger—Information was requested relative to the installation of sewers and sewage disposal plants. General methods of financing such systems, the powers of the council and the costs of such systems in other communities were furnished and discussed. The advisability of employing an engineer was discussed.

Harris—Information was requested relative to the installation and cost of sewer systems. General methods of financing such systems, the powers of the council and the costs of such systems in other communities were furnished and discussed. The advisability of employing an engineer was discussed.

Hawkeye—Information was requested relative to the cost of sewers and sewage treatment plants. The necessity for the installation of a sewer system was discussed. Methods of financing such systems and

powers of the council and cost of similar installations in other towns were explained. The employment of an engineer was recommended.

Lake Mills—Information on sewers and sewage disposal, and operation of water plants was requested and furnished. Statistical data showing rates charged for electrical power for pumping purposes and information relative to other installations was furnished.

Leon—Information relative to water supply was requested and furnished. Possible sources of supply were discussed and the advantages and disadvantages of deep and shallow wells were discussed.

Mapleton—Information relative to plumbing code and ordinances was requested by the city council. Copies of such codes were furnished.

Mason City—Information was requested on the operation of incinerators and methods of garbage collection. Tests of the Mason City incinerator plant are being made at the present time. These tests will be run intermittently during the year, and are expected to furnish valuable data, not only with reference to the operation of this particular plant, but for a bulletin on this subject. Visited by D. C. Faber and H. W. Wagner.

Massena—Information relative to the installation of private sewage disposal plants was furnished the school board on request. The general method of handling the sewage was considered and the uses and limitations of private plants in this connection were discussed and experimental data furnished.

Montezuma—Information was requested and furnished relative to sewer systems and sewage disposal plants. The necessity and desirability of proper facilities for the disposal of sewage were emphasized. The cost of such systems in other communities was discussed.

Oxford Junction—Information relative to the installation of private sewage treatment plant was furnishd the school board. The general method of handling sewage, also cost and limitations of private plants were discussed and experimental data furnished.

Rolfe—Information was requested relative to the regulation of plumbing and sewer connections, by the town council. Plumbing codes and ordinances were discussed, and assistance given in framing an ordinance regulating plumbing installations and sewer connections in Rolfe, and the inspection of the same under the direction of the council.

Spirit Lake—Information was requested relative to the regulation of plumbing and sewer connections, by the council. Plumbing codes and ordinances were discussed, and assistance given in framing an ordinance and regulating plumbing installations and sewer connections in Spirit Lake, and the inspection of the same under the direction of the council.

Stuart—Information on the storage of water was furnished. Advantages and disadvantages of various types of storage reservoirs were discussed. Costs of similar reservoirs in other communities were furnished.

Sutherland—Information was requested relative to water supply for municipal purposes. Possible sources of supply were discussed. The advantages and disadvantages of deep and shallow wells were considered.

Van Meter—Information relative to the installation of private sewage treatment plant was furnished the school board. The general method of handling sewage, also cost and limitation of private plants was discussed and experimental data furnished.

Waterloo—Information was requested relative to the disposal of garbage. Methods of sewage disposal and garbage collection and disposal were discussed. Various reports on collection of garbage and ashes were furnished.

West Branch—Information was requested relative to the installation of sewers and sewage disposal plants. General methods of financing such systems, the powers of the council and the costs of such systems in other communities were furnished and discussed. The advisability of employing an engineer was discussed.

Wilton—Information was requested relative to the installation of sewers and sewage disposal plants. General methods of financing such systems, the powers of the council and the costs of such systems in other communities were furnished and discussed. The advisability of employing an engineer was discussed.

Winfield—Information relative to plumbing code and ordinances was requested by the city council. Copies of such codes were furnished.

Winterset—Information on construction of sewers and sewage disposal plant was requested. Visited by D. C. Faber for purpose of supplying information relative to the construction of a sewer system and sewage disposal plant to the city council. Types of sewage disposal plants and costs of such plants in other places were discussed. The necessity for complete plants was emphasized and the advisability of the employment of an engineer was discussed.

Woodward—Visited by Dr. S. W. Beyer for the purpose of furnishing the town council information relative to water supply. Possible sources of supply and the advantages and disadvantages of deep and shallow wells were discussed.

SANITARY SURVEYS

Sanitary surveys were made by the Engineer of the State Board of Health in the following cities and towns where the installation of sanitary sewers and sewage treatment plants was contemplated:

Afton	*	Marcus	*
Boone	**	Melcher	**
Calmar	**	Milford	*
Creston	*	Newton	*
George	*	Rock Valley	***
Gilmore City	**	Story City	**
Graettinger	**	Winterset	**
Indianola	**		

*Have made the contemplated installations.

**Have obtained plans and specifications for the contemplated installations.

***Plans under advisement.

Sanitary surveys were made at the following mining towns for the purpose of providing a safe water supply and improving unsanitary conditions: High Bridge, Rexton and Ward.

Sanitary survey of ice fields at Fort Dodge, to determine sources of pollution of the Des Moines River where the ice fields of Fort Dodge are located. These ice fields are so located that the surface wastes of a large portion of the city of Fort Dodge are carried by run-off water immediately into the Des Moines River at and immediately upstream from the ice fields. The effluent from the septic tank located at the Hog Serum Plant also flows into the Des Moines River a short distance above the ice fields.

The conditions found apparently constituted a serious menace to the health and lives of the people.

Steps have been taken to provide satisfactory purification of the effluent from the Hog Serum Plant and it is now understood that the present ice fields will be abandoned and new ice fields located upstream in the Des Moines River above the Hydro-Electric Power Plant where the river pollution will be minimum.

LIST OF INSPECTIONS OF SEWAGE TREATMENT PLANTS, SEWAGE SYSTEMS, WATER WORKS.

BY LAFAYETTE HIGGINS AND J. H. DUNLAP.

July 1, 1916, to June 30, 1918.

1916.

July 14. (Higgins) Ogden, sewage treatment plant.
Aug. 28. (Higgins) Mitchellville, sewage treatment plant at State Industrial School for Girls.
Oct. 3. (Higgins) Woodward, sewage treatment plant at State Colony and Hospital for Epileptics.
Dec. 8. (Higgins) Storm Lake, sewage treatment plant.

1917.

Jan. 19. (Higgins) Grinnell, sewage treatment plant.
Jan. 24. (Higgins) Indianola, sewage treatment plant.
Mar. 5. (Higgins) Newton, sewage treatment plant.
Mar. 29. (Higgins) Carroll, sewage treatment plant.
Apr. 23. (Higgins) Grinnell, sewage treatment plant.
June 9. (Higgins) Grinnell, sewage treatment plant.
June 14-16. (Dunlap) Oakdale, sewage treatment plant at State Sanitorium.
June 18. (Dunlap) Ames, sewage treatment plant.
June 19. (Dunlap) Nevada, sewage treatment plant, sewerage system and waterworks.
June 20. (Dunlap) State Center, sewage treatment plant, sewerage system and waterworks.
June 21. (Dunlap) Marshalltown, sewer outlets.
June 21. (Dunlap Tama, sewerage system and waterworks.
June 22. (Higgins) Seymour, waterworks and outfall sewers.
June 22. (Dunlap) Toledo, sewage treatment plant, sewerage system and waterworks.
June 23. (Higgins) Centerville, sewage treatment plant and waterworks.
June 23. (Dunlap) Marion, two sewage treatment plants and waterworks.
June 25. (Dunlap) Mt. Vernon, sewage treatment plant, sewerage system and waterworks.
June 26. (Dunlap) Lisbon, sewage treatment plant, sewerage system and waterworks.
June 27. (Dunlap) Tipton, sewage treatment plant, sewerage system and waterworks.

June 28. (Dunlap) DeWitt, sewage treatment plant, sewerage system and waterworks.
June 29. (Dunlap) Walcott, sewage treatment plant, sewerage system and waterworks.
June 30. (Dunlap) West Liberty, sewage treatment plant, sewerage system and waterworks.
July 2. (Dunlap) Oakdale, sewage treatment plant at State Sanitorium.
July 3-4. (Dunlap) Mitchellville, sewage treatment plant at State Industrial School for Girls.
July 6. (Dunlap) Ogden, sewage treatment plant, sewerage system and waterworks.
July 7. (Dunlap) Jefferson, sewage treatment plant, sewerage system and waterworks.
July 9. (Higgins) Mason City, sewage treatment plant.
July 9. (Dunlap) Carroll, sewage treatment plant, sewerage system and waterworks.
July 10. (Higgins) Clarion, sewage treatment plant.
July 10. (Dunlap) Denison, sewerage system and waterworks.
July 11. (Dunlap) Lake View, sewage treatment plant, sewerage system and waterworks.
July 11. (Dunlap) Lake City, sewerage system and waterworks.
July 12. (Higgins) Marcus, waterworks.
July 12. (Dunlap) Dayton, sewer outlets and waterworks.
July 13. (Higgins) LeMars, waterworks.
July 13. (Higgins) George, waterworks.
July 13. (Dunlap) Stratford, sewage treatment plant, sewerage system and waterworks.
July 14. (Higgins) Sheldon, sewage treatment plant and waterworks.
July 14. (Dunlap) Jewell, sewage treatment plant, sewerage system and waterworks.
July 15. (Higgins) Emmetsburg, sewage treatment plant and waterworks.
July 16. (Higgins) Spirit Lake, source of public water supply.
July 16. (Higgins) Graettinger, waterworks.
July 16. (Dunlap) Vinton, sewerage system and waterworks.
July 17. (Dunlap) Traer, sewage treatment plant, sewerage system and waterworks.
July 18-19. (Dunlap) Reinbeck, sewage treatment plant, sewerage system and waterworks.
July 19-20. (Dunlap) Oelwein, sewage treatment plant, sewerage system and waterworks.
July 20. (Dunlap) Independence, sewerage system and waterworks.
July 23-27. (Dunlap) Fairfield, two sewage treatment plants, sewerage system and waterworks.
July 30-31. (Dunlap) Ottumwa, sewerage system and waterworks.
Aug. 2-3. (Dunlap) Oskaloosa, two sewage treatment plants, and waterworks.
Aug. 4. (Dunlap) Knoxville, two sewage treatment plants, sewerage system and waterworks.

Aug. 7. (Higgins) Newton, sewage treatment plant.
Aug. 7-8. (Dunlap) Albia, sewage treatment plant, sewerage system and waterworks.
Aug. 9. (Dunlap) Chariton, three sewage treatment plants, sewerage system and waterworks.
Aug. 10. (Dunlap) Osceola, two sewage treatment plants, sewerage system and waterworks.
Aug. 15. (Dunlap) Ackley, sewage treatment plant, sewerage system and waterworks.
Aug. 16. (Dunlap) Hampton, sewage treatment plant, sewerage system and waterworks.
Aug. 17. (Dunlap) Waverly, sewerage system and waterworks.
Aug. 21. (Dunlap) Greene, sewage treatment plant, sewerage system and waterworks.
Aug. 22. (Dunlap) Tripoli, sewage treatment plant, sewerage system and waterworks.
Aug. 23. (Dunlap) Sumner, sewage treatment plant, sewerage system and waterworks.
Aug. 24. (Dunlap) New Hampton, sewage treatment plant, sewerage system and waterworks.
Aug. 25. (Dunlap) Mason City, sewage treatment plant.
Aug. 25. (Dunlap) Charles City, sewer outlets and waterworks.
Aug. 27-31. (Dunlap) Newton, sewage treatment plant.
Aug. 31. (Dunlap) Grinnell, sewage treatment plant.
Sept. 8. (Higgins) Newton, sewage treatment plant.
Sept. 21. (Higgins) Newton, sewage treatment plant.
Sept. 27. (Higgins) Grinnell, sewage treatment plant.
Sept. 28. (Higgins) Montezuma, waterworks and sewage system.
Oct. 1. (Higgins) Newton, sewage treatment plant.
Nov. 22. (Higgins) Grinnell, sewage treatment plant.

1918.

Jan. 25. (Higgins) Montezuma, waterworks.
Jan. 28. (Higgins) Sigourney, sewage treatment plants and waterworks.
Feb. 14. (Higgins) Carroll, sewage treatment plant.
Mar. 9. (Higgins) Mason City, sewage treatment plant.
Apr. 24. (Higgins) Audubon, sewage treatment plants.
May 15. (Higgins) Rolfe, sewage treatment plant.
May 21. (Higgins) Tipton, public school toilets.
June 12. (Higgins) Grinnell, sewage treatment plant.
June 17. (Higgins) Oelwein, sewage treatment plant.
June 18. (Higgins) Postville, sewage treatment plant.
June 19. (Higgins) New Hampton, sewage treatment plant.
June 27. (Higgins) Mitchellville, sewage treatment plant at Industrial School.
June 28. (Higgins) Woodward, sewer and sewage treatment plant at State Hospital.

INSPECTION OF SEWAGE TREATMENT PLANTS IN IOWA.

BY J. H. DUNLAP,

Associate Professor of Hydraulics and Sanitary Engineering, State University of Iowa.

During the summer of 1917 the State Board of Health found it possible to employ the writer for about three months for the purpose of inspecting water works, sewer systems and sewage treatment plants. Of the 114 sewage treatment plants in the State it was found possible to visit only 39 plants, located in 32 different cities and towns. In addition to this, three sewage treatment plants at state institutions were inspected.

The following types of plants were found: Twenty-four with preliminary sedimentation tanks and intermittent sand filters; eight with two septic tanks without sand filters; two with septic tanks and contact beds; one with two septic tanks and a sprinkling filter; one with one Imhoff tank and a sprinkling filter; one with two Imhoff tanks and three contact beds; one with one septic tank and a sewage pond; one with one Imhoff tank without sand filters. Of the 24 plants with sedimentation tanks and intermittent sand filters, 8 had sedimentation tanks of the Imhoff type. Of the latter, two plants had two Imhoff tanks; the remaining six, one Imhoff tank each. Discussion will be confined to operation of plants with sedimentation tanks, or with tanks and intermittent sand filters, since 32 of the 39 plants inspected were of this type.

Now, of all these 39 plants not one can be scored 100 per cent efficient. Of course the conditions found at the time of the visit may not do some of the plants justice. Seemingly every possible variation from perfection was found. A summary of the actual findings at the 24 plants with both sedimentation tanks and sand filters may prove instructive. Unless otherwise stated, each plant has two septic tanks and two sand filters. The populations given are those of the 1915 census.

Ackley, population 1,289. The filters were weedy, the sand ridges between the two beds were broken through and there were holes in the filters leading directly to the underdrains. Care had been insufficient.

Albia, population 5,138. The two Imhoff tanks were found to be miniature septic tanks. The slot connecting the sedimentation chamber with the sludge chamber had been clogged up and the sedimentation chamber was well sludged up. The flat slab covers made it practically impossible to operate the Imhoff tanks properly. The filter beds were somewhat out of level, and the distribution was uneven. The plant had been receiving insufficient care.

Ames, population 5,091 (city plant). Both filters were flooded with sewage, due to too high a rate of filtration.

Carroll, population 4,031. The plant consists of two septic tanks and five sand filters. The filter beds have about reached their normal capacity. The plant was in excellent condition with the exception of some trouble with the siphons. The plant receives regular, intelligent care.

Charlton, population 5,235. The three plants, each with one Imhoff tank and two intermittent sand filters, were completely neglected. The flat slab covers made the Imhoff tanks quite inaccessible.

DeWitt, population 1,877. The filters were overloaded and slightly weedy. With these exceptions the plant was in first-class condition, since it receives excellent, regular care.

Fairfield (southeast plant), population 6,113. The plant consists of one Imhoff tank and three sand filters. The Imhoff tank was found to be a miniature septic tank, since the connection between the sedimentation chamber and the sludge chamber had become clogged and the sedimentation chamber had become well sludged up. The flat slab cover made it difficult to keep the Imhoff tank in good operating condition. The grit chambers were misunderstood. The filter beds were being operated with no ridges between the three filters. The wooden distribution troughs were in bad condition. The plant had not been receiving proper care.

Fairfield (northeast plant). The type of plant and the conditions found were the same as at the southeast plant just described.

Grinnell, population 5,061. The plant consists of two Imhoff tanks and four sand filters. The two Imhoff tanks were found to be sludged up. The sedimentation chambers were miniature septic tanks. The distribution upon the sand filters was found imperfect. Trouble was experienced in removing sludge from the tanks since no water connections were available. The plant was receiving regular but not intelligent care. The flat slab covers have now been removed.

Knoxville, population 3,541. The two filter beds were badly overworked. The tile distribution lines needed attention. The siphons have always caused trouble. The plant receives excellent care.

Lake View, population 814. The two filters were somewhat weedy, and soil from the banks was being washed down upon the surface of the beds. The outfall wall was being undermined. The plant was receiving care every two weeks.

Lisbon, population 879. The filter beds needed weeding; the distribution over the beds needed correcting; some repairs were necessary upon the distributors. No care is given the plant.

Marion (new plant), population 4,675. The two filters showed uneven distribution of sewage. The siphons were giving trouble. Since there is no sludge bed the sludge from the septic tanks is flushed directly into the creek.

Mount Vernon, population 1,568. The two sand filters were badly overworked. With no sludge bed available, the custom is to sludge the septic tank directly into the creek. The plant has excellent care.

Nevada, population 2,686. Both filters were being by-passed at the time of visit. One filter was still flooded from high water in the creek. The filter beds were badly overworked, operating at least three times the normal rate. In winter the beds are by-passed. The plant receives regular care.

Newton, population 5,165. Serious trouble with gas waste had put both the Imhoff tank and the two filter beds out of commission. The Imhoff tank had been improperly constructed in the first place, with holes at the bottom of the sedimentation chambers instead of continuous slots. The flat slab cover has been removed.

Oelwein, population 7,137. The plant consists of two septic tanks and four sand filters. The filter beds were badly overworked. The plant receives regular daily care.

State Center, population 1,037. The filter beds were by-passed at the time of the visit. The beds needed cleaning, and the banks needed seeding. The plant receives no regular care.

Sumner, population 1,585. The plant consists of one septic tank and two sand filters. The filters were permanently by-passed since they had been constructed with their drainage system too near the level of the creek.

Tipton, population 2,176. The filter beds were badly overworked. They had been flooded recently and the plank distributors floated out of place. With no sludge bed, the septic tanks are sludged directly into the creek. The filters are by-passed in winter. The plant receives little care.

Toledo, population 1,721. Both filter beds were found flooded from high water in the creek. In winter the plant is by-passed. It receives no regular care.

West Liberty, population 1,760. The two sand filters were badly overworked. Due to trouble with the siphons one bed was receiving more than its share of the sewage. The beds were uneven on the surface and badly clogged. The sludge from the septic tanks is flushed directly into the creek. In the winter the plant is apparently by-passed. The care received is negligible.

With this general survey in mind of all the plants visited, it may be interesting to imagine now a composite plant, made up of all of those described. Some of the weaknesses of this composite Iowa plant, viewed from the operating standpoint, will now be presented. One caution is necessary. Such suggestions as will be made are offered in no spirit of destructive criticism.

Of course many of the defects found are due solely to the inadequate funds available at the time of construction. The discussion will follow this order: first, grit chambers; second, septic tanks; third, Imhoff tanks; fourth, sludge beds; fifth, siphon chambers; sixth, intermittent sand filters.

1. GRIT CHAMBERS.

Grit chambers must be so made that all parts are readily accessible. Flat slab covers, close to the surface of the sewage, with insufficient openings, must be done away with.

Grit chambers must be thoroughly cleaned after each storm, and at least once a week in dry periods. Therefore, adequate means for flushing out their contents must be provided. Grit chambers under conditions in Iowa, whose contents must be removed by lifting them out of the top of the chambers, are naturally seldom cleaned. Accordingly, they soon become small septic tanks and are worse than useless. The valves upon these grit chambers should be so made that they are easily operated.

2. SEPTIC TANKS.

The impression still remains in the minds of many city officials that septic tanks are cure-alls. One town council was found during the past summer with such confidence in septic tanks that just the possession of them was thought sufficient without actually running the sewage through the tanks. These tanks, built in 1913, had been by-passed ever since their construction.

It is of course well known now by all those at all acquainted with the subject that septic tanks are useful only in providing preliminary treatment for sewage. As with the grit chamber, the old-fashioned slab cover with a few manhole openings must be abandoned. No septic tank should be constructed which cannot be entered readily at all times. This requires a cover of such height above the sewage that the operator may walk erect upon the runways over the tank. The inlet channels to the septic tanks should be so designed that they are self-cleansing. Rectangular cross sections and slow velocities allowing deposits are to be avoided. Since most of our Iowa plants suffer from excessive infiltration of ground water during a long period in the spring, ample overflows must be provided, so that the septic tank may never work at a higher rate than it should. This subject of overflows

has in the past received practically no attention in Iowa plants. Accordingly, during the spring, septic tanks either are by-passed, or their contents are so agitated by the flood of sewage and ground water entering them that the rest of the plant is permanently injured by the high amount of sludge carried out of the tanks through the siphons over onto the sand beds.

Ample provision should be made for the proper removal of sludge. This means, first of all, a sludge bed large enough for any use to which it may be put. With tanks designed with nearly level bottoms, as has been the custom in the past, it becomes necessary in sludging out the tanks to empty their contents upon the sludge bed. Of course one hears the wise advice that only small amounts of sludge should be removed from such tanks at a time. If any one has ever attempted to do this in Iowa tanks, where only a foot to two feet of clearance is available between the surface of the sewage and the cover, one knows how impracticable it is to carry out this plan. One great advantage to be gained by doing away with this low slab cover is the comparative ease with which the sludge problem may be handled. The design of the slopes of the bottoms of septic tanks should be more carefully studied. The use of hopper-shaped bottoms should be more frequently found. The valves should be more conveniently located. The usual plan of having one valve at one end of the tank makes removal of the sludge unnecessarily difficult. If but one valve can be used, a much better position for it would be between the inlet and the center of the tank, but nearer the center, with the bottom sloping properly toward the valve.

All the valves used in septic tanks or in any other part of the disposal plant should be so made as to be operated easily. It has been the custom in the past to attempt to save money by using cheap sluice valves of poor design. It would be a good plan if the designing engineer were compelled, after two or three years, to return to the disposal plant which he has designed and, in case any valve is found which cannot be opened easily in two minutes, he should receive a jail sentence.

Frequently the designing engineer has apparently given little time to the study of the proper sizes of the two tanks which are usually found in Iowa plants. In most cases were such a study made it would be found advisable to construct one of the two tanks smaller than the other. To construct two tanks of the same size usually presupposes that the entire present population

is to be connected at once to the sewers. The facts of the case are that after several years there may be only 50 to 75 per cent of the population connected. By properly proportioning the small tank, over-septicization of the sewage may be avoided. The old-fashioned flowing-through period of twenty-four hours injures the sewage for subsequent treatment upon filter beds. A period of flow of six to eight hours is an average requirement for Iowa conditions.

3. IMHOFF TANKS.

As with septic tanks and grit chambers, so with Imhoff tanks—the flat slab cover must be dispensed with. Every part of the Imhoff tank must be readily accessible. With some plants the side walls of the sedimentation basins must be cleaned and the slots opened once a day. With other plants once a month is sufficient. It is essential in constructing the sedimentation chamber that the surfaces upon which the solids settle should be finished smooth. The slopes of the bottoms of the sedimentation chambers should not be too flat. A wide enough slot at the bottom of the chamber should be planned so that the sludge may not readily clog it up. One large Imhoff tank plant visited during the past summer has been constructed without much attention to smooth surfaces in the sedimentation chambers. The ridges between the boards on the forms were nearly all in evidence. Two results are sure in such a case. First, the walls and aprons of the sedimentation chambers cannot be properly cleaned. Second, due to the fact that the sludge is not all removed, some of it will become septic, and when gas-filled will rise to the surface, thus interfering with the proper efficiency of sedimentation.

The design must be so worked out that there are no sludge or gas pockets underneath the walls comprising the sedimentation chamber. Such sludge or gas pockets are frequently found in tanks provided with double sedimentation chambers with chimney gas vents between the chambers. The sludge and gas collecting in these pockets will eventually cause trouble by coming up through the slot in the bottom of the sedimentation chamber, thus interfering with the fundamental purpose for which Imhoff tanks are designed.

Wherever possible, there should be an emergency drain pipe so designed and constructed that the level of the sewage in the tanks may be lowered easily below the slots of the sedimentation

chambers. In this way tedious and expensive pumping is avoided in case it becomes necessary to empty these sedimentation chambers in order to clean the slopes and open the slots, or to remove obstinate sludge from the digestion chambers.

Probably every Imhoff tank ought to be constructed with such connections to water under pressure that the sludge in the bottom of the tank, together with the sludge immediately underneath the bottom of the sludge pipe, may readily be broken up and agitated. Without such a connection to water under pressure, it has sometimes been found difficult to start the sludge out through the sludge pipe. Furthermore it has been found that as soon as the sludge came out, a cone of sludge was removed at the bottom of the tank, thus permitting raw sludge and even raw sewage to escape through the sludge pipe instead of the well-ripened sludge farther out from the center of the tank. By loosening up the well-compacted sludge at the bottom of the tank by water forced under pressure through a grid, the formation of this cone may be controlled.

4. SLUDGE BEDS.

In connection with the discussion of septic tanks, it has been pointed out that sludge beds for septic sludge should have such areas that all of the requirements of operation may be satisfied. This statement also applies to sludge beds for Imhoff tanks. Before the sludge bed can be properly designed, the plan of operation for septic tanks or Imhoff tanks must be thoroughly worked out. All possibilities must be investigated.

The flow line of the inlet carrying the sludge upon the bed should be high enough above the surface so that the sludge will not back up in the sludge pipe, and thus with accumulated deposits ultimately stop it up. Distribution troughs are unnecessary for sludge from either septic tanks or Imhoff tanks.

The sludge beds should be as porous as possible. An inch or two of sand upon the top of about a foot of properly graded material is common practice in the large Imhoff plants in the east. Of course, immediately in front of the inlet must be placed a flat slab or baffling device to spread out the incoming flow of sludge, thus decreasing its velocity and preventing scour of the material composing the sludge bed.

The practice at many plants of sludging out tanks directly into drainage ditches or creeks should be discontinued. Sludge beds

should be constructed and used, even if pumping is necessary. No direct by-pass of sludge to creeks should be included in the design of a plant.

5. SIPHON CHAMBERS.

A primary necessity for siphon chambers is that all parts of them be readily accessible. Accordingly the old-fashioned flat slab cover, close down to the surface of the sewage, must be abandoned. In case a flat slab cover is to be used, it should be at such a height that the operator may stand erect within the tank in carrying out the repairs frequently necessary upon the siphons and in flushing out the interior. Flushing connections are necessary, due to the accumulation of light flaky sludge settling out of the effluent from sedimentation tanks upon the floors of the siphon chambers. The flushing valve should be so situated that the slope of the floor is toward the valve. In at least one plant in Iowa the sludge cannot be removed from the siphon chamber without considerable labor, since during construction the inspector did not insist upon the contractor constructing a smooth floor with the proper slope. Of course, a by-pass for the effluent from the sedimentation tanks should be included in the design of the siphon chamber.

The word "automatic" siphon is a misnomer. While such siphons will operate automatically, occasionally, for long periods of time, yet at any moment the proper alternation of the siphons may cease. Accordingly all piping, vents, blow off traps and starting wells should be so located as to be easily accessible. In many plants in Iowa it is so difficult to get at the siphons and their auxiliary connections that they are very naturally neglected. This means, ultimately, trouble and expense. For instance, unless it is easily possible to operate all of the valves upon the piping, they are likely never to be moved from one year's end to another. In this way they may become immovable.

6. INTERMITTENT SAND FILTER BEDS.

A great many filter beds in Iowa are overworked. Engineers differ concerning the area which should be provided. The state board of health has concluded from information which has thus far come to its notice that under Iowa conditions with ordinary residential sewage from our small towns, intermittent sand filters may be operated at a rate of 100,000 gallons per acre per

day. This assumes that one acre of sand filter will care for the sewage of 2,000 people. On the average 50 gallons per capita per day of domestic sewage is found. During wet weather this is increased for long periods of time by about 50 gallons per capita per day of ground water infiltration. Thus, in the wet seasons of the year the amount per capita expected is about 100 gallons per capita per day, or 200,000 gallons per acre per day. For short periods of time much higher rates are common.

Many filter beds have berms, four to five feet wide at the top with slopes 1½: 1, around each individual filter bed. When beds are symmetrically located side by side, much area may be saved if they are separated by sand ridges ten or twelve inches high. No inconvenience in operation has been found where this method has been consistently followed. In selecting sand for sewage filters, the State Board of Health should be consulted. A study has been made of many of the sand deposits in Iowa and the requirements for filter sand have been adjusted to suit average Iowa conditions.

One common fault in the operation of filter beds in Iowa is the uneven distribution of the sewage over the surface of the bed. Two types of distributors are in common use, the plank trough distributor, and the sewer tile distributor. The plank trough distributor is commonly installed with branches leading out, ostensibly so as to cover well the surface of the bed with the incoming sewage. In actual operation these branches are sometimes removed and a single line of plank trough left down the center of deterioration. In some instances they have been frequently floated out of place by the filters being flooded either from high water in the creeks or by infiltration of ground water into the sewers. In such cases the operator may not return them properly to place or properly to level. In general, the tile distributors, especially those consisting of a single line of tile down the center of the beds, were found to be giving better service than the plank distributors. The operators of the plants, however, need instruction as to how to alter the flow through both tile and plank distributors so that equal amounts of sewage may reach equal areas.

In some instances the banks around the filters were found to be washed down upon the surface of the sand with every rain. In such cases a trench should be made at the bottom of the slopes of the banks deep enough to intercept the wash from the rainfall. After each storm this trench shall be cleaned out. In this way

the sand surface itself will not become clogged. Of course the permanent remedy in such a case is to sod the banks.

In case the filter bed becomes flooded, under no circumstances should holes be made in the sand so that the sewage may find its way directly to the underdrains. Furthermore, spading of beds or plowing of beds should not be permitted. The surface should be stirred only to a depth of half an inch. This may be done, in case the surface mat becomes water tight, either with garden rakes or by a harrow and horse, with the harrow specially constructed so that it would be impossible to work the sand deeper than half an inch. The driver must not be permitted to stand upon the harrow, since the sand would almost certainly be stirred too deeply. Of course, garden cultivators, stirring about three inches deep, should not be tolerated.

In the winter operation of beds in Iowa in the past, two methods have been followed. It is feared that the most common method has been to by-pass the beds directly into the creeks. This should be discontinued, since it defeats the purpose for which sewage treatment systems are designed. The second method used has been to ridge the beds so that the ridges might support the ice which forms during long continued cold weather. This year some of our plants are trying with success the pile method. This plan has been used for many years in large plants in the East. At the time of the last thorough fall cleaning before freezing weather sets in, the dirty sand and surface mat which is scraped up is left in piles, six to eight inches high, three to eight feet apart. It has been found that these piles support the ice and provide small channels around their bases so that the sewage finds its way out beneath the ice cover over the surface of the sand.

GENERAL SUGGESTIONS.

In this discussion of some of the features of operation and design of this imaginary composite Iowa sewage treatment plant no attempt has been made to cover the field of operation and design completely. The books now available make any such attempt superfluous. Such scattering observations as have been made represent conclusions which any one might reach if he had the same opportunity of visiting so many plants within so short a time.

conclusions which any one might reach if he had the same opportunity of visiting so many plants within so short a time.

Viewing this composite sewage treatment plant as a whole, certain suggestions may be made. Every plant, no matter how small, should have included in its equipment a tool house. Of course, the superstructures of sedimentation tanks may be so designed as to serve this purpose, but usually no place is available to store the few implements which are required around the plant. Furthermore, the operator needs some protection from inclement weather. In this house the operator may make out the reports which ought to be required. Here he may carry out the simple tests which he ought to make. For instance, tests upon the efficiency of operations of the sedimentation tanks should be made. Probably the test which will in the long run prove most satisfactory (although it has certain drawbacks) is the use of the conical Imhoff glasses.

These glasses are about 4 in. in diameter at the top and 17 in. high, and have a capacity of one liter. By placing one liter of raw sewage in one glass and the same amount of tank effluent in the other, after two hours the cubic centimeters of settling solids are read. The removal of settleable solids ought to average 95 per cent.

Furthermore, the relative stability of the effluent from the sand filters, and perhaps of the water in the stream above and below the outlet, ought to be determined. The methylene blue test for relative stability is so simple and yet so useful that it ought to be part of the weekly routine of the operation of all plants, no matter how small. A 0.05 per cent solution of methylene blue, preferably the commercial double zinc salt, is used. This is obtainable at any drug store. About 150 cc. of sewage is placed in a glass-stoppered bottle with all air excluded. After adding 0.4 cc. of the methylene blue solution, the mixture is kept at room temperature. It is observed regularly to determine how many days it will retain the blue color. Ten days' retention of color is rated at 90 per cent relative stability. This means that the sample contains 90 per cent of the available oxygen required for perfect stability. The following table from Standard Methods of Water Analysis: American Public Health Association, 1917, p 70, gives the relation between the time in days required to decolorize methylene blue at 68 degrees F. and the relative stability number.

Relative Stability Numbers.

Time required for decolorization at 68 F. Days.	Relative Stability Percentage.
0.5	11
1.0	21
1.5	30
2.0	37
2.5	44
3.0	50
4.0	60
5.0	68
6.0	75
7.0	80
8.0	84
9.0	87
10.0	90
11.0	92
12.0	94
13.0	95
14.0	96
16.0	97
18.0	98
20.0	99

The sludge levels in the sedimentation tanks should be measured regularly. The engineer should leave with the operator devices for this purpose, such as a graduated cord or wire with a weighted board or iron plate attached in such a way as to remain horizontal. No plant visited possessed anything of this kind.

Certain industrial wastes must be guarded against. Grease from garages and waste from creameries and from gas plants must not find their way directly into the sewage treatment plant.

Some means must be provided for measuring the flow through the plant. In some cases an ordinary weir will enable this to be done. Another simple plan is to have some sort of float-operated recording device in the dosing chamber. Simple devices are upon the market for recording in this way the number of flushes which take place. By knowing the capacity of the siphon chamber, a fairly accurate knowledge of the rate of flow through the plant is obtained. It is strange in how few plants any idea exists as to the one fact which is most fundamental of all, namely, how much sewage is being handled. Of course the rate of flow through sedimentation tanks may be studied with the use of dye.

In many cases more attention ought to be paid to simple means of beautifying the grounds about our sewage treatment plants. The plant at Mount Vernon is an example of a successful attempt

of this kind. Here a small amount of shrubbery has been obtained at little or no expense, and by its presence at the plant tones up the whole place.

Finally, this composite Iowa plant should have every by-pass sealed by the State Board of Health. Wherever such a seal must be broken, a written report, stating the cause, should be made to the Board within twenty-four hours. For violating this rule a severe fine or imprisonment, or both, should be fixed by law. The by-passing of sewage treatment plants has become a matter of course. The dictates both of law and of common sense are thereby transgressed with no compunctions of the community conscience whatsoever. The remedy recommended, though drastic, would correct much of the present carelessness and thoughtlessness.

The important question now remains: What can be done to insure the proper operation of our sewage treatment plants here in Iowa, at present so neglected? It is said that misery loves company. Judging from all accounts, Iowa has plenty of company in its neglect of sewage treatment plants. Our neighboring states are many of them facing the same problem.

Four remedies for the maladies of sewage works in Iowa will be suggested. First, it must be said that no plant can be properly operated unless it is properly designed in the first place. While there seems to be plenty of Iowa engineers who understand the principles of design, yet in the past some irresponsible work has been done. In this regard the Iowa State Board of Health is now rendering a most valuable service to the municipalities of Iowa by its requirement that all plans be stamped with its approval. This is likewise a great service to the sanitary engineers of the state, as indeed they recognize, since it insures work of high grade by all competitors.

Second, with the present requirements of the State Board of Health meeting with such favorable results, it apparently is now time for the Board to add another requirement to its present list, namely, that engineers include in their contracts an agreement to operate for at least one year every sewage treatment plant designed. If this is made a requirement of the State Board of Health, then all engineers will be forced to include in their financial agreements with our towns and cities a sum sufficient to cover the cost of this inspection and operation. If it were not a requirement by the State Board of Health, some engineers might

wish to name a fee high enough to include operation, but might find it impossible in the face of competition from other engineers who might feel that this was unnecessary.

By such supervision of operation of each sewage treatment plant for a period of at least one year two results would ensue. One result would be that every new sewage treatment plant would be properly operated during a most difficult period of its existence. A second beneficial result would be that incidentally each engineer would have an opportunity to try out under actual operating conditions all the features of his design. Such experience would prove invaluable. During the year of operation some competent man could be trained properly to care for the plant, make the proper tests, and fill out the proper reports for the State Board of Health. In instructing the local operator of the plant, it must be kept in mind that this individual is a more or less transitory character. Accordingly, explicit directions for each detail of operation must be made out and left where they will not be forgotten or lost. Probably the best plan is to have such directions framed and hung in the tool house at the plant. These directions should not neglect some parts of the plant while being very comprehensive about other parts. Some of the engineers of Iowa already are conscientiously leaving such directions. In no case have they been found, however, at the plant itself. In most instances they were filed away by city clerks with other like material and forgotten.

Engineers must remember that the average individual does not understand blue prints. They mean little or nothing to men of the type who will operate the sewage plant. Accordingly a free use of isometric or perspective drawings should be made, as well as of photographs taken during the process of construction. These drawings and photographs, when properly framed and hung in the tool house, would preserve in a form easily understood the essential facts concerning the construction of the plant. This is especially necessary in the case of Imhoff tanks, which are now coming to be so common in Iowa. The average man finds it impossible to understand from blue prints the underlying principles of design and operation of Imhoff tanks. He can learn more from one isometric drawing, or perhaps from one photograph taken at the proper time during construction, than from a whole volume of blue prints.

The chances are that the operator of the sewage treatment plant will have had no technical training whatever. The operators of the 39 sewage treatment plants visited on this inspection trip may be classified as follows: 12 of the plants had no regular care; 8, were in charge of engineers; 6, of the street commissioner; 5, of the city marshal; 4, of the water works superintendent; 1, of the marshal and street commissioner; 1, of the chairman of the sewer committee; 1, of the mayor; 1, of the city clerk. It was found to be too commonly the case that the man supposedly in charge of the plant already had too much municipal work assigned to him to do.

Third, it is probably true that final responsibility for the operation of our sewage treatment plants must rest with the State Board of Health, therefore annual inspections should be made regularly of all sewage treatment plants in the state. In some instances lawsuits have forced towns to operate their plants properly. Where no such pressure as this exists, some central authority must be in direct control. A bulletin setting forth, by photographs and description, the principal facts concerning the operation of Iowa sewage treatment plants would be a real service. Another requirement ought to be regular reports upon blanks made out by the State Board of Health.

Fourth, and finally, in order to make possible this additional supervision on the part of the State Board of Health, greatly increased financial support must be secured from the State Legislature.

OFFICE WORK OF THE ENGINEER.

(a)

APPROVAL OF PLANS AND SPECIFICATIONS.

Terril, Dickinson County, population 452. Plans and specifications for a waterworks system prepared by L. W. Cox. This waterworks system was completed before the plans and specifications were approved. Plans and specifications were approved in July, 1916.

Oakland, Pottawattamie County, population 1,196. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by J. H. Mayne, Consulting Engineer, Council Bluffs, Iowa. The plans provide for the sewering of one sewer district which comprises the greater part of the town. The sewage treatment plant consists of a septic tank, and siphon chamber, housed, and intermittent sand filters. A sewage lift is required to pump the sewage from the outlet sewer into the sewage

treatment plant. The plans and specifications were approved in July, 1916.

Note.—The town council of Oakland elected to assume the responsibility of deferring the installation of the sewage treatment plant until such time in the near future when the town could finance the project. The sanitary sewer system has been installed.

Mt. Pleasant, Henry County, population 4,089. Plans and specifications for sanitary sewers and sewage disposal plants prepared by M. G. Hall. The plans and specifications provide for outlet sewers to collect the discharge from existing sewers. The sewage treatment plant consists of a housed Imhoff tank, siphon chamber and intermittent sand filters. The plans and specifications were approved July 11, 1916.

Fort Madison, Lee County, population 9,507. Revised plans and specifications for waterworks system and water purification system, prepared by Burns & McDonnell. The revised plans show a change of location of waterworks and pumping station and filtration plant. The location of the intake remains as originally planned. The revised plans and specifications were approved July 19, 1916.

Panora, Guthrie County, population 1,107. Plans and specifications for sanitary sewers, outlet sewers and sewage treatment plant, prepared by Bruce & Standeven. The plans show the entire town to be included in one sewer district. The purification plant consists of a septic tank and siphon chamber, housed, and intermittent sand filters. The plans and specifications were approved July 21, 1916.

New Hampton, Chickasaw County, population 2,664. Plans and specifications for a sewage treatment plant prepared by Frederic Bass, Consulting Engineer. The sewage treatment plant consists of an Imhoff tank, a dosing chamber, and trickling filters supplied with secondary settling tank. The plans and specifications were approved July 29, 1916.

Note.—These plans and specifications were substituted for the plans and specifications which were approved by the State Board of Health, May 24, 1916. This substitution was made at the request of the city council of New Hampton.

Fredericksburg, Chickasaw County, population 635. Plans and specifications for a sanitary sewer system with sewage treatment plant, prepared by C. H. Currie, Engineer. The sewage treatment plant consists of an Imhoff tank, a siphon chamber, and intermittent sand filters. The plans and specifications were approved August 28, 1916.

Germania, Kossuth County, population 426. Plans and specifications for a sanitary sewer system with sewage treatment plant prepared by H. M. Carr, Engineer. The sewage treatment plant consists of an Imhoff tank, a siphon chamber, and intermittent sand filters. The plans and specifications were approved August 29, 1916.

Fort Madison, Lee County, population 9,507. Plans and specifications for a sanitary sewer system prepared by Burns & McDonnell, Engineers. The plans utilize the existing sewer system as far as the same may be made practicable. No sewage treatment plant has been fully designed for the reason that the sewage is discharged into the Mississippi River, an interstate stream. The location for a sewage treatment plant to be installed in the future has been determined upon and a pumping station has been provided for pumping the sewage into the Mississippi River,

which pumping station may be used in connection with a sewage treatment plant when installed. The plans and specifications were approved August 31, 1916.

Stratford, Hamilton County, population 601. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by Price & McCormack, Civil Engineers, Missouri Valley, Iowa. The sewage treatment plant will consist of a septic tank, a siphon chamber and intermittent sand filters, or trickling filters, plans having been prepared for both types of filters. The plans and specifications were approved September 11, 1916.

Corning, Adams County, population 1,884. Plans and specifications for waterworks improvements, prepared by E. T. Archer & Co. The plans provide for the installation of an impounding reservoir, a purification plant and a pumping plant. Plans and specifications were approved October 6, 1916.

Alton, Sioux County, population 988. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by the Alamo Engine & Supply Company, Consulting Engineers, Omaha, Neb. The sewage treatment plant consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved November 9, 1916.

Note.—The town council omitted the housing of the tank and required the tank to be covered with a concrete cover. This change was made without the knowledge or approval of the State Board of Health.

Stuart, Guthrie County, population 1,849. Plans and specifications for a sanitary sewer and sewage treatment plant, prepared by Theo. S. DeLay. The sewage treatment plant consists of an Imhoff tank with removable cover, a siphon chamber and intermittent sand filters. The plans and specifications were approved November 9, 1916.

Dows, Wright County, population 1,001. Plans and specifications for a sanitary sewer system with a sewage treatment plant, prepared by M. Tschirgi & Sons, Cedar Rapids, Iowa. The sewage treatment plant consists of a septic tank and a siphon chamber, housed with a cement and frame superstructure, and intermittent sand filters. The plans and specifications were approved November 20, 1916.

Fayette, Fayette County, population 1,175. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by G. H. Bishop. The sewage treatment plant consists of a septic tank, a siphon chamber and intermittent sand filters. The plans were approved December 11, 1916.

Walnut, Pottawattamie County, population 1,008. Plans and specifications for a deep well for a public water supply, prepared by Charles P. Chase, Engineer. The plans provide for a well approximately 1,500 feet in depth, 100 feet to be cased with a twelve-inch casing, 300 feet to be cased with an eight-inch casing, and below the casing the well to be drilled in rock eight inches in diameter for 800 feet and six inches diameter for 300 feet. The plans and specifications were approved December 21, 1916.

Rockwell City, Calhoun County, population 1,864. Plans and specifications for a sewage treatment plant prepared by J. H. Mayne. The proposed installation to include a housed septic tank, a siphon chamber, and intermittent sand filters. The plans were approved December 11, 1916. The specifications were approved December 21, 1916.

Lenox, Taylor County, population 1,320. Plans and specifications for a sanitary sewer and sewage treatment plant, prepared by Robert H. Hammond. The plans and specifications are an abridgement of plans and specifications prepared by Theodore L. DeLay and were approved August 11, 1915. The present installation includes the main sewer and part of the laterals and the sewage treatment plant. The plans and specifications were approved December 26, 1916.

Rinard, Calhoun County, population 156. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by S. F. Moeller, Drainage Engineer. The plans and specifications provide for the installation of a sanitary sewer to supply the principal portion of the town, with the further provision for extending the sewer system to include the entire town in the future. The sewage treatment plant consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved in December, 1916.

West Union, Fayette County, population 1,773. Plans and specifications for the extension of the sewer system, and for a sewage treatment plant, prepared by G. H. Bishop and G. A. Blunt, Civil Engineers. The sewage treatment plant consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved January 5, 1917.

Denver, Bremer County, population 478. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by G. H. Bishop, Civil Engineer. The sewage treatment plant consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved January 9, 1917.

Dunlap, Harrison County, population 1,393. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by Price & McCormack. The sewage treatment plant consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved January 12, 1917.

Havelock, Pocahontas County, population 278. Plans and specifications for a system of waterworks, prepared by C. W. Roland. The plans provide for an elevated steel tank, 30,000 gallons capacity, a pumping station with the necessary pumping machinery and the customary distributing pipe system. The plans and specifications were approved January 26, 1917.

Note.—It is proposed to take the water supply from a deep well to be located in the business portion of the town. Plans and specifications for the construction of the well and a record of the borings are to be filed for approval.

Knoxville, Marion County, population 3,541. Plans and specifications for sanitary sewers and a sewage disposal plant prepared by M. G. Hall. The sewers planned are additional to present installations. The disposal

plant consists of an Imhoff tank, housed, a siphon chamber and intermittent sand filters. An alternative plan for septic tank is also submitted. The plans and specifications were approved February 1, 1917.

Rolfe, Pocahontas County, population 1,115. Plans for a sanitary sewer system with sewage treatment plant, prepared by C. H. Currie. The sewage treatment plant consists of a housed Imhoff tank, a siphon chamber, and intermittent sand filters. The plans and specifications were approved February 1, 1917.

Indianola, Warren County, population 3,495. Plans and specifications for reconstruction of the north septic tank and intermittent sand filters prepared by A. H. Gilliland, Civil Engineer, Indianola, Iowa. The plans and specifications were approved March 2, 1917.

Newton, Jasper County, population 5,165. Plans and specifications for sanitary sewers and sewage treatment plants, prepared by M. G. Hall. The sewer plans are for additional sewers, such plans being made following a complete topographical survey by means of which the city was correctly districted into several sewer districts providing for the complete sewering of the city. The plans provide for a small sewage treatment plant for the west outlet, said plant consisting of a housed septic tank, siphon chamber, and either sand or trickling filters; and for a large disposal plant for the south outlet sewer, which disposal plant consists of Imhoff tanks, a siphon chamber and intermittent sand filters. The plans and specifications were approved March 7, 1917.

Winterset, Madison County, population 2,860. Plans and specifications for sanitary sewer system and sewage treatment plant prepared by Price & McCormack. The plans show the city of Winterset to be divided into two sewer districts with sewage treatment plant for each district. The sewage treatment plants consist of housed septic tanks, dosing chambers and trickling filters. The plans and specifications were approved March 23, 1917.

Wilton, Muscatine County, population 1,176. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by D. G. Fisher & Company. The plans show practically the entire town included in one sewer district. The sewage treatment plant consists of a septic tank and siphon chamber, housed, and intermittent sand filters. The plans and specifications were approved March 26, 1917.

West Burlington, Des Moines County, population 1,091. Plans and specifications for a sanitary sewer system with sewage treatment plant prepared by Stevens & Stiles, Engineers. The plans show that the entire town is included within one sewer district. The sewage treatment plant consists of a housed Imhoff tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved March, 1917.

Sheldon, O'Brien County, population 3,323. Plans and specifications were for the reconstruction of the sewage treatment plant prepared by M. V. Norris, City Engineer. The plans provide for the reconstruction of the siphon chamber, and for the construction of intermittent sand filters of adequate area. The plans and specifications were approved April 5, 1917.

West Branch, Cedar County, population 712. Plans and specifications for a sanitary sewer system with sewage treatment plant prepared by M. Tschirgi & Sons. The plans provide for one sewer district. The sewage treatment plant consists of a housed septic tank, and sewage lift and intermittent sand filters. The sewage lift is arranged to discharge the tank effluent upon the sand filters. The plans and specifications were approved April 16, 1917.

Garner, Hancock County, population 1,226. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by Chas. P. Chase. The plans show practically the entire town included in one sewer district. The sewage treatment plant consists of a housed septic tank; a siphon chamber and intermittent sand filters. The location of the sewage treatment plant is such that provision is made for pumping the sludge from the septic tank. The plans and specifications were approved April ....., 1917.

Ft. Madison, Lee County, population 9,507. Plans for the new waterworks intake for the new waterworks system prepared by Burns & McDonnell. The plans were approved May 7, 1917.

Coin, Page County, population 665. Plans and specifications for a water supply system prepared by L. W. Cox, Engineer. The plans provide for the water supply to be taken from several shallow bored wells. The plans provide the customary distribution system, and the necessary pumping facilities. The plans and specifications were approved May 10, 1917.

Note.—An elevated steel tank will be installed under plans and specifications prepared by the Des Moines Bridge & Iron Company, of Des Moines, Iowa.

Creston, Union County, population 7,572. Plans and specifications for sewage treatment plant prepared by Theodore S. DeLay. The plans provide for an open Imhoff tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved May 11, 1917.

Merrill, Plymouth County, population 536. Plans and specifications for a sanitary sewer system with sewage disposal plant prepared by Price & McCormack. The plans show the entire town to be included in one sewer district. The sewage treatment plant consists of a housed septic tank with siphon chamber and intermittent sand filters. The plans and specifications were approved May 16, 1917.

Early, Sac County, population 534. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by E. T. Archer & Company. The plans show the entire town to be included in one sewer district. The sewage treatment tank consists of a housed septic tank and siphon chamber with intermittent sand filters. The plans and specifications approved June 11, 1917.

Afton, Union County, population 1,007. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by Robt. H. Hammond, Engineer. The plans provide for the division of the town into three sewer districts. The plans and specifications as completed provide for the sewering of Districts No. 1 and 2, and the outlet sewers from these districts uniting and discharging into one sewage treatment plant. District No. 3 is unprovided for, but in the future will require a separate

sewage treatment plant. The sewage treatment tank consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved June 18, 1917.

Farley, Dubuque County, population 729. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by G. H. Bishop, Engineer. The plans provide for practically the entire town to be included in one sewer district. The sewage treatment plant consists of a housed septic tank and siphon chamber with intermittent sand filters. The plans and specifications were approved June 21, 1917.

Ankeny, Polk County, population 526. Plans and specifications for a sanitary sewer and sewage treatment plant prepared by Lawrence W. Cox. The plans show the entire town to be included in one sewer district. The sewage treatment plant consists of a housed Imhoff tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved June 25, 1917.

Spirit Lake, Dickinson County, population 1,602. Plans and specifications for extension of present sewer system, new sanitary sewers and new sewage treatment plant prepared by C. H. Currie. The plans provide for the greater portion of the town to be supplied by a gravity sewer system. A portion of the town is sewered by a system of sewers which will deliver their sewage to a pumping station where the sewage will be lifted into the gravity system. The sewage treatment plant consists of a housed Imhoff tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved June 27, 1917.

Grand Mound, Clinton County, population 481. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by Chas. P. Chase. The plans provide for the entire town to be included in one sewer district. The sewage treatment plant consists of a housed septic tank and siphon chamber and intermittent sand filters. The plans and specifications were approved July 6, 1917.

Glenwood, Mills County, population 3,291. Plans and specifications for extension of present sewer system and sewage treatment plants prepared by Theodore S. DeLay, Engineer. The plans and specifications were approved July 30, 1917.

Seymour, Wayne County, population 2,146. Plans and specifications for a sanitary sewer system and sewage treatment plants prepared by M. G. Hall. The plans provide for two sewer districts, two sanitary sewer systems and two sewage treatment plants. The sewage treatment plants consist of housed Imhoff tanks, a siphon chamber and intermittent sand filters. The plans and specifications were approved July 30, 1917.

Graettinger, Palo Alto County, population 743. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by C. H. Currie, Engineer. The plans provide for the sewering of the entire town in one sewer district. The sewage treatment tank consists of a housed Imhoff tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved August 3, 1917.

Milford, Dickinson County, population 823. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by Chas. P. Chase. The plans provide for one sewer district, including practically all of the town. The sewage treatment plant consists of a housed septic tank and siphon chamber and intermittent sand filters. The plans and specifications were approved August 9, 1917.

North McGregor, Clayton County, population 575. Specifications for a concrete reservoir and water supply system prepared by D. G. Fisher & Company. The plans and specifications provide for the construction of a concrete reservoir, pumping station, and distributing pipe system. The specifications were approved September 24, 1917.

Marcus, Cherokee County, population 987. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by M. G. Hall. The plans provide for practically the entire town to be included in one sewer district. The sewage treatment tank consists of a housed Imhoff tank, a siphon chamber and intermittent sand filters. A sewage lift is recommended, to be located at the outlet of the main sewer, by the designing engineer. An alternative plan for a gravity plant is also provided by the engineer but not recommended. The plans and specifications were approved September 26, 1917.

Conrad, Grundy County, population 620. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by T. R. Perry. The plans show the entire town included in one sewer district. The sewage treatment plant consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved September 27, 1917.

George, Lyon County, population 704. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by W. J. McEathron. The plans provide for including the entire town in one sewer district. The sewage treatment plant consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved October 1, 1917.

Clarksville, Butler County, population 965. Plans and specifications for a sanitary sewer system and a sewage treatment plant prepared by G. H. Bishop. The plans provide for the entire town to be included in one sewer district. The sewage treatment plant consists of a housed septic tank and siphon chamber, and intermittent sand filters. The plans and specifications were approved October 25, 1917.

Paullina, O'Brien County, population 875. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by W. J. McEathron, Engineer. The plans and specifications provide for sewering about three-fourths of the town in two sewer districts. The sewage treatment plant consists of septic tanks and intermittent sand filters. The plans and specifications were received and examined, and further information relative to conditions affecting the installation were asked. Complete plans and specifications were not filed with the State Board of Health for approval, but during 1917 the town council proceeded to install

the sewer system and partially installed a sewage treatment plant without the knowledge or approval of the State Board of Health.

Rockwell, Cerro Gordo County, population 726. Plans and specifications for a sanitary sewer system and sewage treatment plant prepared by Keeri & Stevens. The plans show the entire town to be included in one sewer district. The sewage treatment tank consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved January 9, 1918.

Gilmore City, Pocahontas County, population 935. Plans and specifications for a sanitary sewer system and a sewage treatment plant prepared by C. H. Currie. The plans show the entire town to be included in one sewer system. The sewage treatment plant consists of a septic tank and dosing tank, housed, and trickling filters. The plans and specifications were approved February 16, 1918.

Victor, Iowa County, population 754. Plans and specifications for a sanitary sewer system with sewage treatment plant, prepared by M. Tschirgi. The plans show the entire town to be included in one sewer district, with the provision that a sewage lift be installed, when future needs require, to pump the sewage from a small portion of the town into the sewer system. The sewage treatment plant consists of a septic tank and a siphon chamber, housed, and intermittent sand filters. The plans and specifications were approved March 4, 1918.

Montezuma, Poweshiek County, population 1,326. Plans and specifications for an outlet sewer and sewage treatment plant prepared by Prof. J. H. Dunlap, Civil and Sanitary Engineer, Iowa City, Iowa. The outlet sewer is designed to receive the sewage from existing sewers and all future extensions thereto. The sewage treatment plant consists of a housed Imhoff tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved March 6, 1918.

Laurens, Pocahontas County, population 848. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by C. H. Currie, Engineer. The plans and specifications provide for the sewering of the entire town in one sewer district. The sewage treatment plant consists of a housed septic tank and siphon chamber, and intermittent sand filters. The plans show the greater portion of the town supplied by gravity flow with the lower sections of the town supplied with pumping stations. The plans and specifications were approved April 25, 1918.

Nevada, Story County, population 2,686. Plans and specifications for waterworks improvements, prepared by M. I. Evinger, Engineer. The plans and specifications provide for a 200,000 gallon reservoir, pumps, and discharge and suction mains. The plans and specifications were approved June 3, 1918.

Danbury, Woodbury County, population 578. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by Price & McCormack. The plans show practically the entire town included in one sewer district. The sewage treatment tank consists of a housed septic tank, a siphon chamber and intermittent sand filters. The plans and specifications were approved June 11, 1918.

Woodward, Dallas County, population 820. Plans and specifications for a sanitary sewer system and sewage treatment plant, prepared by R. C. Lutze, Engineer. The plans show the entire town included in one sewer district. The sewage treatment plant consists of a housed septic tank and siphon chamber, and intermittent sand filters. The plans and specifications were approved June 20, 1918.

Lake Park, Dickinson County, population 709. Preliminary plans and specifications for a sanitary sewer system and sewage treatment plant prepared by C. H. Currie. Preliminary plans and specifications were approved in March, 1918.

OFFICE WORK.

(a)

SUMMARY OF APPROVALS.

City or Town	County	Date Approved	Purpose
Afton	Union	June 18, 1917	Sanitary sewer system.
Alton	Sioux	November 9, 1916	Sanitary sewer system.
Ankeny	Polk	June 25, 1917	Sanitary sewer system.
Clarksville	Butler	October 25, 1917	Sanitary sewer system.
Coin	Page	May 10, 1917	Water works.
Conrad	Grundy	September 27, 1917	Sanitary sewer system.
Corning	Adams	October 6, 1916	Water works improvements.
Creston	Union	May 11, 1917	Sewage treatment plant.
Danbury	Woodbury	June 11, 1918	Sanitary sewer system.
Denver	Bremer	January 9, 1917	Sanitary sewer system.
Dows	Wright	November 20, 1916	Sanitary sewer system.
Dunlap	Harrison	January 12, 1917	Sanitary sewer system.
Early	Sac	June 11, 1917	Sanitary sewer system.
Farley	Dubuque	June 21, 1917	Sanitary sewer system.
Fayette	Fayette	December 11, 1916	Sanitary sewer system.
Fort Madison	Lee	August 31, 1916	Sanitary sewer system.
Fort Madison	Lee	July 19, 1916	Revised water work plans.
Fort Madison	Lee	May 7, 1917	Water works intake.
Fredericksburg	Chickasaw	August 28, 1916	Sanitary sewer system.
Granger	Hancock	April, 1917	Sanitary sewer system.
George	Lyon	October 1, 1917	Sanitary sewer system.
Germania	Kossuth	August 29, 1916	Sanitary sewer system.
Gilmore City	Pocahontas	February 16, 1918	Sanitary sewer system.
Glenwood	Mills	July 30, 1917	Sewer extensions.
Granger	Palo Alto	August 3, 1917	Sanitary sewer system.
Grand Mound	Clinton	July 6, 1917	Sanitary sewer system.
Havelock	Pocahontas	January 26, 1917	Water works
Indianola	Warren	March 2, 1917	Reconstruction filters.
Knoxville	Marion	February 1, 1917	Sanitary sewer system.
Lake Park	Dickinson	March, 1918	Sanitary sewer system.
Laurens	Pocahontas	April 25, 1918	Sanitary sewer system.
Lenox	Taylor	December 26, 1916	Sanitary sewer system.
Marcus	Cherokee	September 26, 1917	Sanitary sewer system.
Merrill	Plymouth	May 16, 1917	Sanitary sewer system.
Milford	Dickinson	August 9, 1917	Sanitary sewer system.
Montezuma	Poweshiek	March 6, 1918	Sewage treatment plant.
Mt. Pleasant	Henry	July 11, 1916	Sewage treatment plant.
Nevada	Story	June 3, 1918	Water works improvements.
New Hampton	Chickasaw	July 29, 1916	Sewage treatment plant.
Newton	Jasper	March 7, 1917	Sewage treatment plant.
North McGregor	Clayton	September 24, 1917	Water works.
Oakland	Pottawattamie	July, 1916	Sanitary sewer system.
Panora	Guthrie	July 21, 1916	Sewage treatment plant.
Paullina	O'Brien	(Installed 1917)	Sanitary sewer system.
Rinard	Calhoun	December, 1916	Sanitary sewer system.
Rockwell	Cerro Gordo	January 9, 1918	Sanitary sewer system.
Rockwell City	Calhoun	December 11, 1916	Sewage treatment plant.
Rolfe	Pocahontas	February 1, 1917	Sanitary sewer system.
Seymour	Wayne	July 30, 1917	Sanitary sewer system.
Sheldon	O'Brien	April 5, 1917	Sewage filters.
Spirit Lake	Dickinson	June 27, 1917	Sewer extensions and sewage treatment plant.
Stratford	Hamilton	September 11, 1916	Sanitary sewer system.
Stuart	Guthrie	November 9, 1916	Sanitary sewer system.
Terrill	Dickinson	July, 1916	Water works.
Victor	Iowa	March 4, 1918	Sanitary sewer system.
Walnut	Pottawattamie	December 21, 1916	Deep well, water supply.
West Branch	Cedar	April 16, 1917	Sanitary sewer system.
West Burlington	Des Moines	March, 1917	Sanitary sewer system.
West Union	Fayette	January 5, 1917	Sewer extension.
Wilton	Muscatine	March 26, 1917	Sanitary sewer system.
Winterset	Madison	March 23, 1917	Sanitary sewer system.
Woodward	Dallas	June 20, 1918	Sanitary sewer system.

OFFICE WORK OF THE ENGINEER.

(b)

CONSULTATION SERVICE BY CORRESPONDENCE.

The letters which passed between the engineer of the State Board of Health and the officials, or residents, or engineers of the municipalities listed below were not ordinary communications. In many cases several letters passed before the necessary information was completed, requiring in all 985 letters. In most cases, the communications were lengthy, explanatory, and involved technical discussions. It is fair to assume also that the information given in this manner was not limited to the parties receiving the communications. Frequently an inquiry from one party would give information to several neighbors or to the residents of an entire town.

County	City or Town	Subject of Inquiry
Adair	Adair	Unsanitary conditions.
Adams	Corning	Public water supply.
		Abatement of nuisance.
		Unsanitary sewer.
Allamakee	Postville	Sanitary sewer system.
Appanoose	Centerville	Disposal of canning factory waste.
	Moulton	Unsanitary privies.
	Udell	Wrongful use of tile drains as sewers.
Audubon	Audubon	Sewage treatment plant.
Benton	Belle Plaine	Public water supply.
	Blairstown	Septic tank.
	Keystone	Sanitary sewer system.
Black Hawk	La Porte City	Well for water supply.
Boone	Boone	Sewage treatment plant.
		Disposal of sewage at County Home.
Bremer	Denver	Disposal of house sewage.
	Tripoli	Disposal of Creamery waste.
Buena Vista	Alta	Privy pollution of wells.
	Newell	Unsanitary conditions.
	Storm Lake	Sewage filters.
Butler	Aplington	Pollution of well.
	Clarksville	Sanitary sewer system.
Calhoun	Lake City	Sanitary sewer system.
	Rockwell City	Sewage treatment plant.
Carroll	Carroll	Sewage treatment plant.
	Dedham	Cesspools.
Cass	Anita	Tubular wells.
	Atlantic	Sanitary plumbing and ventilation.
	Cumberland	Disposal of school sewage.
Cedar	Tipton	Disposal of school sewage.
	West Branch	Sanitary sewer system.
Cerro Gordo	Mason City	Disposal of packing house sewage.
		Disposal of waste from beet sugar factory.
	Rockwell	Sewage treatment plant.
		Sewage disposal.
		Sanitary sewer system.
Cherokee	Marcus	Smead Incinerator for Public School.
		Cesspools.
		Sanitary sewer system.
	Quimby	Unsanitary school building.
Chickasaw	Fredericksburg	Sanitary sewer system.
		Sewage treatment plant.
	Lawler	Residential sewage treatment plants.
	New Hampton	Sewage filters.
		Sewage treatment plants.
Clarke	Woodburn	Septic tanks.
Clay	Spencer	Outlet sewers.
Clayton	North McGregor	Public water supply.

County	City or Town	Subject of Inquiry
Clinton	Clinton	Sewage treatment plants.
	DeWitt	Septic tanks.
	Grand Mound	Sanitary sewer system.
Crawford	Denison	Septic tank.
	Dow City	Disposal of school sewage.
Dallas	Dallas Center	Unsanitary conditions.
	Dawson	Disposal of domestic sewage.
	Dexter	Septic tanks.
	High Bridge (Village)	Water supply for miners.
	Minburn	Residential sewage treatment plant
	Perry	Garbage disposal.
	Redfield	Septic tanks.
	Scandia (Village)	Unsanitary conditions.
	Van Meter	Chemical closets.
	Woodward	Sewage filters.
		Filter gravel.
		Public water supply.
		Sewage treatment plant.
		Sanitary sewer system.
Davis	Bloomfield	Reconstruction of city septic tanks.
Decatur	Davis City	Disposal of laundry waste.
Delaware	Colesburg	Septic tanks.
Des Moines	Mediapolis	Septic tanks.
	West Burlington	Sanitary sewer system.
Dickinson	Lake Park	Sanitary sewer system.
	Milford	Sanitary sewer system.
	Okoboji (Village)	Disposal of residential sewage.
	Orleans	Sanitary sewer system.
Dickinson	Spirit Lake	Public water supply.
		Sanitary sewer system.
Dubuque	Dyersville	Sanitary sewer system.
		Method of constructing sewers.
Emmet	Armstrong	Sanitary sewer system.
Fayette	Fayette	Sanitary sewer system.
	Hawkeye	Sanitary sewer system.
	Oelwein	Sewage treatment plant.
	Westgate	Use of cesspools.
	West Union	Septic tanks.
		Chemical closets.
Floyd	Charles City	Cesspools.
		Disposal of school sewage.
		Septic tanks.
Fremont	Riverton	Sanitary closets.
	Sidney	Wells used as cesspools.
Greene		Residential sewage treatment plants.
	Jefferson	Stock yard nuisance.
		Disposal of community wastes.
		Chemical treatment of water.
Grundy	Conrad	Sanitary sewer system.
Guthrie	Guthrie Center	Outlet sewer.
	Panora	Sanitary sewer system.
	Stuart	Deep well water supply.
Hamilton	Jewell	Sewer outlet ditch.
		Sanitary sewer system.
		Surface and basement drainage.
	Kamrar	Dumping ground.
	Stratford	Sanitary sewer system.
	Webster City	Discharge of sewage into river.
Hancock	Britt	Cemetery drainage.
		Residential sewage treatment plants.
	Garner	Septic tanks.
	Klemme	Residential sewage treatment plants.
	Woodbine	Residential plumbing.
Hardin	Ackley	Sewage filters.
	Eldora	Public water supply.
Harrison	Dunlap	Sanitary sewer system.
	Logan	Residential sewage treatment plants.
		Discharge of untreated sewage.
	Missouri Valley	Sanitary sewer system.
	Modale	Septic tanks.
	Persia	Unsanitary conditions.
	Pisgah	Sewage treatment plant for consolidated school.
	Woodbine	Residential plumbing.
Henry	Mt. Pleasant	Sewage filters.
		Sanitary sewer system.
		Filter sand.
		Disposal of canning factory waste.

County	City or Town	Subject of Inquiry
Howard	Cresco	Cesspools.
	Lime springs	Sanitary installations.
		Disposal of contents of privy vaults.
Humboldt	Humboldt	Sanitary sewer system.
Ida	Galva	Sewage treatment plant.
Iowa	Parnell	Sewage filters for public school.
	Victor	Sanitary sewer system.
Jasper	Baxter	Unsanitary conditions.
	Kellogg	Septic tanks.
	Mingo	School sewage.
	Newton	Sanitary sewers.
		Sewage treatment plants.
		Disposal of community refuse.
Johnson	Iowa City	Residential sewage treatment plant.
Jones	Oxford Junction	Sanitary installations.
		Sewer system.
		Rendering plant.
Keokuk	Keota	Sewer construction.
	What Cheer	Unsanitary conditions.
Kossuth	Germania	Sanitary sewer system.
		Sewage disposal.
	Luverne	Disposal of school sewage.
	Titonka	Misuse of tile drain as sewer.
Lee	Donnellson	Care of septic tank.
		Disposal of school sewage.
	Ft. Madison	New water works.
		Sewage treatment plant.
		Sanitary sewer system.
	West Point	Public water supply.
		Deep well for public water supply.
Linn	Kenwood Park	Sanitary sewer system.
	Marion	Sewage filters.
Lucas	Charlton	Sewage purification.
		Concerning use of lead water pipes.
	Lucas	Septic tanks.
Lyon	George	Sanitary sewer system.
Madison	Earlham	Open ditch used as sewer.
	Winterset	Open sewer ditch.
		Sanitary sewer system.
		Residential sewage treatment plants.
Mahaska	New Sharon	Cesspools and septic tanks.
	Oskaloosa	Sewage treatment plant.
Marion	Knoxville	Sanitary sewer system.
	Melcher	Public water supply.
		Sanitary sewer system.
Marshall	Marshalltown	Sewage disposal for public school.
Mitchell	Osage	Wells and cesspools.
		Garbage disposal.
		Sewage disposal.
		Sanitary sewer system.
	Riceville	Plumbing regulations.
Monona	Mapleton	Sanitary sewer system.
		Chemical closets.
	Ute	Concerning use of cesspools.
Monroe	Albia	Packing house sewage.
	Lovilia	Unsanitary conditions.
	Melrose	Unsanitary conditions.
	Rexton (Village)	Water supply for miners.
	Ward (Village)	Water supply for miners.
Montgomery	Villisca	Pollution of surface wells.
		Public water supply.
Muscatine	Moscow (Village)	Chemical closets.
	Wilton	Sanitary sewer system.
O'Brien	Hartley	Sanitary sewer system.
	Paullina	Stockyards nuisance.
	Primghar	Sewage disposal.
	Sheldon	Sewage filters.
	Sutherland	Cesspools.
Page	Clarinda	Public water supply.
	College Springs	Disposal of school sewage.
	Essex	Cesspools and privy vaults.
Palo Alto	Graettinger	Septic tanks.
		Sanitary sewer system.
		Public water supply.
	Ruthven	Stockyards nuisance.
Pocahontas	Gilmore City	Sanitary sewer system.
	Havelock	Public water supply.
	Laurens	Sanitary sewer system.

County	City or Town	Subject of Inquiry
	Palmer	Septic tanks.
		Abuse of drainage system.
		Sewage treatment plant.
	Rolfe	Septic tank.
		Sanitation and sewage.
Polk	Ankeny	Public water supply.
		Sanitary sewer system.
	Camp Dodge	Water supply and sewer system.
Pottawattamie	Oakland	Sanitary sewer system.
		Public water supply.
		Disposal of waste and offal from veterinary hospital.
	Walnut	Deep well for public water supply.
		Public water supply.
Poweshiek	Grinnell	Sewage treatment plant.
		Reconstruction of sewage filters.
		Sanitary survey.
		Disposal of creamery waste.
	Malcom	Cesspools.
	Montezuma	Public water supply.
		Unsanitary conditions.
		Sewage treatment.
Ringgold	Delphos (Village)	Chemical closets.
	Mount Ayr	Disposal of creamery waste.
Sac	Early	Sanitary sewer system.
		Disposal of school sewage.
	Lake View	Garbage disposal.
	Lytton	Septic tanks.
	Nemaha (Village)	Sewage treatment for public school.
	Sac City	Deep well water supply.
Scott	Davenport	Septic tanks.
		Disposal of industrial waste.
		Sanitary plumbing.
		Garbage disposal.
Shelby	Elkhorn	Water supply and sewer system.
	Jacksonville(Village)	Sanitary plumbing.
Sioux	Alton	Sanitary sewer system.
	Hospers	Cesspool for school.
	Maurice	Sanitary sewer system.
	Orange City	Sanitary sewer system.
	Rock Valley	Sanitary sewer system.
	Sioux Center	Septic tank for creamery.
		Disposal of community refuse.
Story	Nevada	Cemetery drainage.
		Rendering plant.
	Roland	Sanitary sewer system.
	Story City	Public water supply.
		Sanitary sewer system.
Tama	Gladbrook	Construction of well for public water supply.
	Toledo	Wells for public water supply.
Taylor	Lenox	Algae in impounding reservoir.
		Sanitary sewer system.
	New Market	Privy pollution of wells.
Union	Afton	Sanitary sewer system.
	Arispe	Sewage treatment plant.
	Creston	Sewage treatment plant.
Van Buren	Birmingham	Residential sewage treatment plant.
		Waterworks and sewers.
	Selma (Village)	Disposal of school sewage.
		Septic tank for school building.
Wapello	Agency	Septic tanks.
	Ottumwa	Unsanitary condition of sewer.
		Chemical toilets.
Warren	Indianola	Sewage filters.
		Public water supply.
Washington	Wellman	Scavenger system.
		Residential sewage treatment plants.
Wayne	Allerton	Sanitary drinking fountains.
	Seymour	Sanitary sewer system.
Webster	Fort Dodge	Septic tanks.
		Pollution of ice fields by Hog Serum plant.
	Harcourt	Unsanitary conditions.
Winnebago	Forest City	Sewer construction.
Winneshiek	Calmar	Sewage treatment plant.
	Decorah	Disposal of creamery waste.
Woodbury	Anthon	Sanitary sewer system.
		Sewage treatment plant.
	Sergeant Bluffs	Sanitation of County Home.

County	City or Town	Subject of Inquiry
Worth	Fertile	Disposal of sewage.
	Northwood	Misuse of drainage system as sewer.
Wright	Dows	Sanitary sewer system.
	Eagle Grove	Ventilation of public school buildings.

Note.—The foregoing list includes inquiries from 91 counties and includes six cities of the first class, 46 cities of the second class, 144 towns and 10 villages.

The inquiries may be classified approximately as follows:

Abatement of Nuisance	4
Cemetery drainage	2
Cesspools	12
Chemical closets	7
Construction and care of sewage treatment plants	32
Disposal of industrial sewage	13
Disposal of school sewage	17
Garbage disposal	9
Methods of sewage disposal	14
Misuse of drainage systems as sewers	5
Plumbing and ventilation	6
Pollution of ice fields	1
Public water supply	40
Residential sewage treatment plants	16
Sanitary sewer systems	71
Septic tanks	24
Unsanitary conditions in municipalities	15

Note.—The foregoing list includes inquiries from 91 counties, and includes 6 cities of the first class, 46 cities of the second class, 144 towns and 10 villages.

OFFICE WORK OF THE ENGINEER.

(c)

ADVICE AND CONSULTATION.

During the biennial period closing June 30, 1918, the following named engineers visited the office of the State Board of Health and personally consulted with the engineer of the State Board of Health relative to water works, sewers and sewage treatment plants, in project for Iowa municipalities:

E. T. Archer
Frederick N. Bass
G. H. Bishop
Chas. P. Chase
L. W. Cox
C. H. Currie
Theo. S. DeLay
Philip K. DeVoe
M. I. Evinger
D. C. Faber
D. G. Fisher & Co.
A. H. Gilliland
M. G. Hall
Robt. H. Hammond
F. W. Hanna
H. D. Keerl
W. H. Kimball
J. H. Mayne
W. J. McEathron
V. A. McCormack
C. S. Nichols
W. A. Price
Lon B. Reynolds
W. E. Standeven
M. Tschirgi

During the same biennial period, municipal officials from the following named municipalities visited the office of the State Board of Health in consultation with the engineer relative to sanitary installations:

Calmar
Creston
Indianola
Melcher
Monroe
New Hampton
New Sharon
Newton
Oelwein
Prairie City
West Burlington

LIST OF CITIES, TOWNS AND VILLAGES IN IOWA. 1918.

Population of cities and towns is compiled from Census of 1915. Population of villages is compiled from information furnished by county auditors and township clerks. An absolutely correct list is not attainable, but the list as given is believed to be practically correct.

Names of incorporated cities and towns, as reported by the Department of Finance and Municipal Accounts, are shown in italics.

This list is compiled to show the extent and progress of installation of waterworks, sewers and sewage treatment plants.

* Waterworks.
** Waterworks and sewers.
***Waterworks, sewers and sewage treatment plants.
****Plans prepared for sewers and sewage treatment plants.

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Abbott	25	Hardin	
Abingdon	70	Jefferson	
Ackley	1,289	Hardin	***
Ackworth	113	Warren	
Acme	14	Howard	
Adair	1,011	Adair	*
Adams	10	Muscatine	
Adaza	20	Greene	
Adel	1,425	Dallas	**
Adolphi	15	Polk	
Afton	1,007	Union	***
Afton Junction	15	Union	
Agency	374	Wapello	
Ainsworth	432	Washington	*
Akron	1,235	Plymouth	**
Albaton	25	Monona	
Albert City	417	Buena Vista	
Albia	5,138	Monroe	***
Albion	477	Marshall	
Alburnett	169	Linn	
Alden	806	Hardin	***
Alexander	302	Franklin	*
Algona	3,593	Kossuth	**
Alice	10	Linn	
Alleman	150	Polk	
Allendorf	39	Osceola	
Allerton	1,015	Wayne	
Allison	535	Butler	*
Almont	20	Clinton	
Alpha	100	Fayette	
Alta	1,078	Buena Vista	*
Alta Vista	304	Chickasaw	*
Alton	988	Sioux	***
Altoona	530	Polk	
Alvord	363	Lyon	*
Amana	500	Iowa	
Amber	65	Jones	
Ames	5,091	Story	***
Amish	71	Johnson	
Anamosa	2,872	Jones	**
Anderson	100	Fremont	
Andover	68	Clinton	
Andrew	332	Jackson	
Angus	100	Boone	
Anita	1,210	Cass	*
Ankeny	526	Polk	***
Anthon	758	Woodbury	***
Aplington	519	Butler	
Arbor Hill	66	Adair	
Arcadia	381	Carroll	*
Archer	139	O'Brien	
Ardon	100	Muscatine	
Ardsdale	220	Butler	
Argo	35	Scott	
Argyle	75	Lee	
Arion	237	Crawford	*
Arispe	127	Union	
Arlington	787	Fayette	*
Armstrong	753	Emmet	**
Arnold	15	Humboldt	
Arnold's Park	408	Dickinson	
Arthur	259	Ida	*
Asbury	25	Dubuque	
Ashawa	15	Polk	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Ashgrove	59	Davis	
Ashton	397	Osceola	***
Aspinwall	108	Crawford	
Astor	13	Crawford	
Atalissa	295	Muscatine	
Athelstan	164	Taylor	
Atkins	250	Benton	
Atlantic	5,039	Cass	**
Attica	150	Marion	
Auburn	410	Sac	
Audubon	2,084	Audubon	***
Augusta	50	Des Moines	
Aurelia	654	Cherokee	*
Aurora	293	Buchanan	
Austinville	75	Butler	
Avenaries	100	Dubuque	
Avery	500	Monroe	
Avoca	1,648	Pottawattamie	**
Avon	40	Polk	
Ayrshire	300	Palo Alto	*
Badger	222	Webster	
Bagley	466	Guthrie	*
Bailey	226	Mitchell	
Baker	17	Jefferson	
Baldwin	267	Jackson	*
Balfour	25	Mills	
Ballstown	60	Dubuque	
Bancroft	893	Kossuth	*
Bangor	10	Marshall	
Barnes City	384	Mahaska	
Barney	59	Madison	
Barnum	152	Webster	
Bartlett	100	Fremont	
Barrett	132	Chickasaw	
Batavia	605	Jefferson	
Battle Creek	688	Ida	**
Bauer	50	Marion	
Baum	25	Cherokee	
Baxter	572	Jasper	
Bayard	706	Guthrie	*
Bayfield	10	Muscatine	
Beacon	489	Mahaska	
Beaconsfield	163	Ringgold	
Beaman	239	Grundy	
Bear Creek	150	Wapello	
Bear Grove	50	Guthrie	
Beaver	137	Boone	
Beckwith	12	Jefferson	
Bedford	1,950	Taylor	***
Beebeetown	25	Harrison	
Belfast	200	Lee	
Belinda	25	Lucas	
Belknap	110	Davis	
Belle Plaine	3,668	Benton	**
Bellevue	1,708	Jackson	*
Belmond	1,419	Wright	***
Beloit	50	Lyon	
Benard	320	Cedar	*
Benson	35	Black Hawk	
Bentley	25	Pottawattamie	
Benton	213	Ringgold	
Bentonsport	200	Van Buren	
Berea	50	Adair	
Berkley	117	Boone	
Berlin	143	Tama	
Bernard	110	Dubuque	
Berne	12	Crawford	
Berram	124	Linn	
Berwick	75	Polk	
Bethlehem	30	Wayne	
Bethseda	30	Page	
Bettendorf	1,376	Scott	**
Beulah	25	Clayton	
Bevington	100	Madison	
Bidwell	150	Wapello	
Big Rock	100	cott	
Bingham	40	Page	
Birmingham	581	Van Buren	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Bladensburg	10	Wapello	
Blairsburg	298	Hamilton	
Blairstown	584	Benton	*
Blakesburg	339	Wapello	
Blanchard	422	Page	*
Blanden	10	Pocahontas	
Blencoe	307	Monona	
Blisdorn	10	Clinton	
Blockton	649	Taylor	*
Bloomfield	2,283	Davis	***
Blue Grass	227	Scott	
Bode	428	Humboldt	*
Boies	20	Black Hawk	
Bolan	35	Worth	
Bolton	50	Mahaska	
Bonair	66	Howard	
Bonaparte	645	Van Buren	*
Bondurant	302	Polk	
Boone	12,253	Boone	**
Boonsville	75	Dallas	
Border Plains	10	Webster	
Botna	35	Shelby	
Boxton	204	Dallas	
Bowen	10	Jones	
Boxholm	225	Boone	
Boyd	50	Chickasaw	
Boyden	394	Sioux	*
Boyer	50	Crawford	
Braddyville	326	Page	
Bradford	150	Franklin	
Bradgate	207	Humboldt	
Brainard	12	Fayette	
Brandon	349	Buchanan	
Brayton	197	Audubon	
Brazil	645	Appanoose	
Breda	413	Carroll	*
Bremer	16	Bremer	
Bridgewater	302	Adair	
Brighton	1,023	Washington	
Bristow	238	Butler	
Brit	1,445	Hancock	*
Bronson	450	Woodbury	
Brooklyn	1,485	Poweshiek	***
Brooks	100	Adams	
Brough	10	Dallas	
Brown	20	Clinton	
Brownville	50	Mitchell	
Bruce	25	Wright	
Brunsville	111	Plymouth	
Brushy	10	Webster	
Bryant	150	Clinton	
Bryantburg	50	Buchanan	
Buchanan	100	Cedar	
Buckeye	193	Hardin	
Buck Grove	92	Crawford	
Buckingham	75	Tama	
Buena Vista	60	Clayton	
Buena Vista	10	Clinton	
Buffalo	493	Scott	
Buffalo Center	908	Winnebago	*
Bunch	100	Davis	
Burchinal	75	Cerro Gordo	
Burdett	23	Franklin	
Burlington	24,561	Des Moines	**
Burnside	60	Webster	
Burrell	30	Decatur	
Burr Oak	300	Winneshiek	
Burt	629	Kossuth	*
Bussey	655	Marion	
Butler	10	Keokuk	
Butler Center	15	Butler	
Buxton	4,000	Monroe	
Cairo	100	Louisa	
Calamus	393	Clinton	
Caledonia	20	Ringgold	
Calhoun	30	Harrison	
California	30	Harrison	
Callender	398	Webster	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Calmar	952	Winneshiek	***
Calumet	208	O'Brien	
Camanche	647	Clinton	
Cambria	100	Wayne	
Cambridge	683	Story	*
Campbell	10	Polk	
Canby	25	Adair	
Canton	100	Jackson	
Carbil	465	Van Buren	
Carbon	304	Adams	
Carbondale	25	Polk	
Carl	25	Adams	
Carlisle	653	Warren	
Carmel	20	Sioux	
Carnavron	25	Sac	
Carnes	20	Sioux	
Carney	12	Floyd	
Carney	200	Polk	
Carnforth	75	Poweshiek	
Carpenter	144	Mitchell	
Carroll	4,031	Carroll	***
Carrollton	50	Carroll	
Carrville	20	Floyd	
Carson	656	Pottawattamie	*
Carterville	75	Cerro Gordo	
Cascade	1,316	Dubuque	*
Casey	801	Guthrie	*
Cass	12	Jones	
Castalia	262	Winneshiek	
Cattana	441	Monona	*
Castle Grove	35	Jones	
Castle Hill	158	Black Hawk	
Cedar	25	Mahaska	
Cedar Bluff	100	Cedar	
Cedar Falls	6,284	Black Hawk	**
Cedar Heights	300	Black Hawk	
Cedar Rapids	40,667	Linn	**
Cedar Valley	50	Cedar	
Centerdale	25	Cedar	
Center Grove	25	Dubuque	
Center Junction	232	Jones	*
Center Point	910	Linn	*
Centerville	7,803	Appanoose	***
Central City	735	Linn	*
Ceralvia	98	Dubuque	
Chapin	100	Franklin	
Chariton	5,235	Lucas	***
Charles City	6,374	Floyd	**
Charleston	125	Lee	
Charlotte	384	Clinton	*
Charter Oak	790	Crawford	****
Chatsworth	135	Sioux	
Chelsea	582	Tama	*
Chequest	14	Davis	
Cherokee	4,704	Cherokee	**
Chester	200	Howard	*
Chickasaw	50	Chickasaw	
Chillicothe	193	Wapello	
Church	40	Allamakee	
Churchville	25	Warren	
Churdan	694	Greene	*
Cincinnati	1,629	Appanoose	
Clare	284	Webster	*
Clarence	671	Cedar	*
Clarinda	4,478	Page	**
Clarion	2,553	Wright	***
Clarkdale	200	Appanoose	
Clarkson	10	Warren	
Clarksville	965	Butler	****
Clay	150	Washington	
Clay Mills	25	Jones	
Clayton	141	Clayton	
Clayworks	10	Webster	
Clearfield	695	Taylor	***
Clear Lake	2,741	Cerro Gordo	
Cleghorn	220	Cherokee	
Clermont	243	Marshall	
Clermont	714	Fayette	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Cleveland	65	Lucas	
Cleves	25	Hardin	
Climbing Hill	25	Woodbury	
Clinton	26,091	Clinton	**
Clio	264	Warne	*
Clive	150	Polk	
Cloverdale	37	Osceola	
Clover Hills	201	Polk	
Clutier	276	Tama	*
Clyde	25	Jasper	
Coal City	200	Appanoose	
Coal Creek	25	Keokuk	
Coalfield	100	Monroe	
Coalville	60	Webster	
Coburg	178	Montgomery	
Cogan	569	Linn	*
Coin	663	Page	*
Coinburg	320	Delaware	
Colfax	2,807	Jasper	**
College Springs	585	Page	
Collins	569	Story	*
Colo	536	Story	*
Columbia	200	Marion	
Columbus City	390	Louisa	
Columbus Junction	1,107	Louisa	**
Commerce	150	Polk	
Communia	25	Clayton	
Conesville	332	Muscatine	
Confidence	30	Wayne	
Conger	10	Warren	
Conover	175	Winneshiek	
Conrad	620	Grundy	***
Conroy	100	Iowa	
Conway	277	Taylor	
Cool	10	Warren	
Coon Rapids	1,219	Carroll	*
Cooper	85	Greene	
Coppock	111	Henry	
Coralville	148	Johnson	
Cordova	50	Marion	
Corley	50	Shelby	
Cornelia	25	Wright	
Cornell	25	Clay	
Corning	1,884	Adams	**
Correctionville	1,056	Woodbury	*
Corwith	557	Hancock	*
Corydon	1,757	Wayne	***
Cosgrove	26	Johnson	
Custer	15	Butler	
Cottage Hill	25	Dubuque	
Cotter	134	Louisa	
Cottonville	40	Jackson	
Cottonwood	25	Lee	
Cou Falls	50	Johnson	
Coulter	307	Franklin	
Council Bluffs	31,374	Pottawattamie	**
Covington	25	Linn	
Craig	135	Plymouth	
Crain Creek	25	Black Hawk	
Cranston	50	Muscatine	
Crawfordsville	323	Washington	*
Crescent	35	Pottawattam'e	
Creston	3,199	Howard	***
Creston	7,872	Union	***
Cricket	25	Mahaska	
Crocker	25	Polk	
Cromwell	179	Union	
Croton	125	Lee	
Crozier	10	Buena Vista	
Crystal Lake	177	Hancock	
Cumberland	574	Cass	*
Cumming	100	Warren	
Curlew	173	Palo Alto	
Cushing	286	Woodbury	*
Cylinder	161	Palo Alto	
Dahlonega	25	Wapello	
Dakota City	447	Humboldt	
Dale	40	Guthrie	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Dallas	329	Marion	
Dallas Center	856	Dallas	
Dalton	10	Plymouth	
Dana	213	Greene	
Danbury	578	Woodbury	****
Danville	280	Des Moines	
Darbyville	200	Appanoose	
Davenport	48,483	Scott	**
David	106	Mitchell	
Davis City	636	Decatur	*
Dawson	306	Dallas	
Dayton	806	Webster	**
Daytonville	100	Washington	
Dean	47	Appanoose	
Decatur	341	Decatur	
Decorah	4,021	Winneshiek	***
Dedham	436	Carroll	*
Deep River	516	Poweshiek	*
Deercreek	15	Worth	
Defiance	401	Shelby	*
Delaware	260	Delaware	
Delhi	438	Delaware	
Delmar	553	Clinton	*
Deloit	266	Crawford	
Delphos	70	Ringgold	
Delphos	70	Ringgold	
Delta	721	Keokuk	
Denison	3,455	Crawford	**
Denmark	300	Lee	
Dennis	25	Appanoose	
Denver	478	Bremer	***
Depew	10	Palo Alto	
Derby	323	Lucas	
Des Moines	105,552	Polk	**
De Soto	298	Dallas	
Devon	25	Chickasaw	
Dewar	75	Click Hawk	
De Witt	1,877	Danton	***
Dexter	810	Dallas	
Diagonal	492	Ringgold	
Diamond	200	Appanoose	
Dickens	201	Clay	
Dike	379	Grundy	*
Dillon	25	Marshall	
Dinsdale	75	Tama	
Dixon	219	Scott	*
Dodgeville	30	Des Moines	
Dolliver	108	Emmet	*
Donahue	85	Scott	
Donnan	30	Fayette	
Donnellson	425	Lee	*
Doon	612	Lyon	*
Dorchester	40	Allamakee	
Douds Leando	250	Van Buren	
Dougherty	232	Cerro Gordo	
Douglass	25	Fayette	
Dover	40	Lee	
Dow City	571	Crawford	*
Downey	200	Cedar	
Dows	1,001	Wright	***
Drakesville	273	Davis	
Dublin	15	Washington	
Dubuque	41,795	Dubuque	**
Dudley	20	Wapello	
Duggan	20	Jackson	
Dumfries	61	Pottawattamie	
Dumont	582	Butler	*
Dunbar	52	Marshall	
Duncan	50	Hancock	
Duncombe	476	Webster	*
Dundee	200	Delaware	
Dunkerton	300	Black Hawk	
Dunlap	1,393	Harrison	****
Dunreath	50	Marion	
Durango	59	Dubuque	
Durant	729	Cedar	*
Durham	50	Marion	
Dysersville	1,885	Dubuque	**

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Eagle Center	75	Black Hawk	
Eagle Grove	4,038	Wright	**
Earlham	749	Madison	*
Earling	307	Shelby	*
Earlville	582	Delaware	*
Early	534	Sac	***
East Amana	100	Iowa	
East Peru	300	Madison	
East Pleasant Plain	80	Jefferson	
Eddyville	1,046	Wapello	
Eden	a. 10	Fayette	*
Edgewood	625	Clayton	
Elberon	339	Tama	
Eldon	2,030	Wapello	*
Eldora	2,729	Hardin	**
Eldorado	75	Fayette	**
Eldridge	236	Scott	
Elgin	611	Fayette	*
Elkader	1,213	Clayton	
Elkhart	161	Polk	**
Elk Horn	527	Shelby	
Elkport	210	Clayton	
Elk River Junction	10	Clinton	
Ellington	541	Hancock	
Elliott	558	Montgomery	
Ellis	10	Crawford	**
Ellston	212	Ringgold	
Ellsworth	530	Hamilton	
Elma	871	Howard	*
Elmira	15	Johnson	*
Elrick	50	Louisa	
Elvira	40	Clinton	
Elwell	10	Story	
Elwood	200	Clinton	
Ely	182	Linn	
Emeline	50	Jackson	
Emerson	464	Mills	
Emmetsburg	2,647	PaloAlto	**
Enterprise	300	Polk	
Epworth	452	Dubuque	*
Erickson	20	Boone	
Estes	797	Page	**
Estherville	4,123	Emmet	**
Evans	75	Mahaska	
Evanston	20	Webster	
Everist	50	Marion	
Everly	472	Clay	
Ewart	75	Poweshiek	
Exira	842	Audubon	*
Exline	651	Appanoose	
Fairbank	629	Buchanan	*
Fairfax	200	Linn	
Fairfield	6,113	Jefferson	***
Fairmount	25	Jasper	
Fairport	200	Muscatine	
Fairview	50	Jones	
Fairville	12	Palo Alto	
Fausers	70	Guthrie	
Farley	729	Dubuque	***
Farlin	80	Greene	
Farmersburg	280	Clayton	
Farmington	1,194	Van Buren	*
Farnhamville	255	Calhoun	
Farragut	511	Fremont	
Farrar	25	Polk	
Farson	50	Wapello	
Faulkner	50	Franklin	
Fayette	1,175	Fayette	***
Fenton	304	Kossuth	*
Ferguson	101	Marshall	
Fern	50	Grundy	
Fernald	75	Story	
Fertile	232	Worth	
Festina	130	Winneshiek	
Fielding	12	Cherokee	
Fifield	12	Marion	
Fifteen Mile	35	Tama	
Fladford	100	Black Hawk	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Fiscus	20	Audubon	
Fisk	28	Adair	
Flagler	100	Marion	
Fleamingville	10	Linn	
Florenceville	53	Howard	
Floris	253	Davis	
Floyd	362	Floyd	
Folletts	45	Clinton	
Folsom	25	Mills	
Fonda	1,106	Pocahontas	*
Fontanelle	868	Adair	*
Ford	10	Warren	
Forest City	2,115	Winnebago	**
Forest Mills	20	Allamakee	
Forestville	12	Delaware	
Fort Atkinson	305	Winneshiek	
Fort Des Moines	538	Polk	
Fort Dodge	19,372	Webster	**
Fort Madison	9,507	Lee	**
Foster	129	Monroe	
Fostoria	146	Clay	
Four Corners	10	Jefferson	
Fraker	150	Monroe	
Franklin	133	Lee	
Franklin Station	35	Lee	
Frank Pierce	45	Johnson	
Frankville	171	Winneshiek	
Fraser	520	Boone	
Fraser Station	519	Boone	
Fredericksburg	635	Chickasaw	***
Frederika	209	Bremer	
Fredonia	200	Louisa	
Frederick	100	Monroe	
Fredsville	25	Grundy	
Freeman	15	Cerro Gordo	
Freeport	50	Winneshiek	
Fremont	520	Mahaska	
Froelich	40	Clayton	
Fruitland	100	Muscatine	
Fulton	120	Jackson	
Galbraith	15	Kossuth	
Galesburg	50	Jasper	
Galland	125	Lee	
Galt	185	Wright	
Galva	478	Ida	**
Gambril	20	Scott	
Garber	128	Clayton	
Garden City	100	Hardin	
Garden Grove	741	Decatur	
Garland	40	Des Moines	
Grasonville	368	Clayton	
Garner	1,226	Hancock	****
Garrison	489	Benton	
Garry Owen	30	Jackson	
Garwin	513	Tama	*
Gates	20	Audubon	
Gaza	100	O'Brien	
Geneva	205	Franklin	
Genoa	15	Wayne	
Genoa Bluff	20	Iowa	
George	704	Lyon	***
Georgetown	50	Monroe	
Gerlach	10	Kossuth	
Germania	426	Kossuth	****
Germantown	80	O'Brien	
Germanville	13	Jefferson	
Giard	100	Clayton	
Gibson	75	Keokuk	
Gifford	25	Hardin	
Gilbert	252	Story	*
Gilbertville	200	Black Hawk	
Gillet Grove	50	Clay	
Gilliat	15	Pottawattamie	
Gilman	477	Marshall	*
Gilmore City	935	Pocahontas	****
Givin	25	Mahaska	
Gladstone	959	Tama	**
Glad tone	50	Tama	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Gladwin	50	Louisa	
Glasgow	70	Jefferson	
Glendon	75	Guthrie	
Glen Ellen	15	Woodbury	
Glenwood	3,291	Mills	
Glidden	913	Carroll	**
Goddard	10	Jasper	*
Goldfield	748	Wright	
Goodell	221	Hancock	*
Goose Lake	113	Clinton	
Gordons Ferry	30	Jackson	*
Gosport	12	Marion	
Gourie	955	Webster	
Grachill	15	Washington	*
Grattinger	743	Palo Alto	
Graf	74	Dubuque	****
Grafton	199	Worth	
Grand Junction	984	Greene	
Grand Mound	481	Clinton	*
Grand River	363	Decatur	***
Grand View	375	Louisa	
Granger	275	Dallas	
Granite	51	Lyon	
Grant	314	Montgomery	
Grant Center	25	Monona	
Grant City	177	Sac	
Granville	415	Sioux	*
Gravity	549	Taylor	
Gray	184	Audubon	
Greeley	379	Delaware	
Greencastle	30	Jasper	
Greene	1,315	Butler	***
Greenfield	1,624	Adair	****
Green Island	147	Jackson	
Green Mountain	100	Marshall	
Greenville	100	Clay	
Grimes	351	Polk	*
Grinnell	5,061	Poweshiek	***
Griswold	1,148	Cass	*
Groveland	10	Clark	
Grundy Center	1,629	Grundy	***
Gruver	110	Emmet	
Guernsey	177	Poweshiek	
Gundor	100	Clayton	
Guss	25	Taylor	
Guthrie Center	1,678	Guthrie	***
Gutenberg	1,886	Clayton	*
Gypsum	20	Webster	
Haibur	168	Carroll	*
Hale	50	Jones	
Hamburg	2,204	Fremont	**
Hamilton	206	Marion	
Hamlin	100	Audubon	
Hampton	3,025	Franklin	***
Hancock	264	Pottawattamie	
Handley	40	Madison	
Hanlontown	180	Worth	
Hanover	15	Buena Vista	
Hansell	100	Franklin	
Hansen Heights	20	Audubon	
Harcourt	303	Webster	
Hardy	150	Humboldt	
Harlan	2,825	Shelby	**
Harper	257	Keokuk	
Harpers Ferry	315	Allamakee	
Harris	308	Osceola	*
Hartford	335	Warren	
Hartley	1,115	O'Brien	***
Hartwick	113	Poweshiek	
Harvard	30	Wayne	
Harvey	400	Marion	
Haskins	75	Washington	
Hastie	25	Polk	
Hastings	432	Mills	
Havelock	278	Pocahontas	*
Haven	75	Tama	
Haverhill	150	Marshall	
Harve	23	Washington	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Hawarden	2,045	Sioux	**
Hawkeye	14	Fayette	*
Hawleyville	100	Page	
Hawthorne	35	Montgomery	
Haywsville	140	Keokuk	
Hayfield	50	Hancock	
Hazelton	507	Buchanan	
Hedrick	926	Keokuk	*
Henderson	238	Mills	
Hepburn	112	Page	
Herndon	60	Guthrie	
Herring	15	Sac	
Herrold	25	Polk	
Hesper	200	Winneshiek	
Hiattsville	10	Appanoose	
High	150	Iowa	
High Bridge	200	Dallas	
Highland	25	Clayton	
Highland	50	Wapello	
Highlandville	120	Winneshiek	
High Point	35	Decatur	
Hills	210	Johnson	
Hillsboro	350	Henry	
Hillsdale	50	Mills	
Hinton	291	Plymouth	*
Hitteman	2,000	Monroe	
Hobart	20	Kossuth	
Hocking	1,000	Monroe	
Holbrook	40	Iowa	
Holland	152	Grundy	
Holly Springs	25	Woodbury	
Holmes	100	Wright	
Holstein	1,137	Ida	***
Holy Cross	134	Dubuque	*
Homer	22	Hamilton	
Homestead	200	Iowa	
Honey Creek	35	Pottawattamie	
Hopeville	91	Clarke	
Hopkinton	336	Delaware	*
Hornick	309	Woodbury	
Horton	40	Bremer	
Hospers	557	Sioux	*
Houghton	75	Lee	
Hubbard	663	Hardin	*
Hudson	411	Black Hawk	*
Hugo	20	Jackson	
Hull	768	Sioux	*
Humboldt	2,061	Humboldt	**
Humeston	1,034	Wayne	*
Huntington	75	Emmet	
Hurstville	180	Jackson	
Hutchins	25	Hancock	
Huxley	357	Story	
Hynes	200	Monroe	
Iconium	120	Appanoose	
Ida Grove	2,090	Ida	**
Imogene	314	Fremont	
Independence	3,683	Buchanan	**
Indianapolis	30	Mahaska	
Indianola	3,405	Warren	***
Inwood	713	Lyon	*
Ioka	25	Keokuk	
Ion	10	Allamakee	
Ionia	201	Chickasaw	
Iowa Center	100	Story	
Iowa City	10,233	Johnson	**
Iowa Falls	3,716	Hardin	**
Ira	100	Jasper	
Ireton	670	Sioux	*
Iron Hills	75	Jackson	
Irving	114	Tama	
Irvington	50	Kossuth	
Irwin	347	Shelby	
Ivester	25	Grundy	
Ivy	10	Polk	
Jackson Jct.	151	Winneshiek	
Jacksonville	100	Shelby	
Jacobs	10	Poweshiek	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Jamaica	403	Guthrie	
James	10	Plymouth	
Jamestown	40	Scott	
Jamison	60	Clarke	
Jansville	313	Bremer	
Jay	10	Clarke	
Jefferson	3,103	Greene	***
Jerson	25	Chickasaw	
Jerome	375	Appanoose	
Jesup	789	Buchanan	*
Jewell	1,074	Hamilton	***
Johnson	20	Polk	
Joice	172	Worth	
Jolley	246	Calhoun	
Jordan	18	Boone	
Jubilee	50	Black Hawk	
Judd	10	Webster	
Julien	40	Dubuque	
Juniata	20	Buena Vista	
Kalo	50	Webster	
Kalona	514	Washington	
Kamrar	268	Hamilton	
Kanawha	516	Hancock	*
Kasson	25	Madison	*
Keen	63	Polk	
Killerton	584	Ringgold	
Kelley	222	Story	
Kelley	619	Jasper	
Kendallville	100	Winneshiek	*
Kennebec	10	Monona	
Kennedy	20	Dallas	
Kenrett	430	Worth	
Kent	166	Union	
Kenwood	136	Linn	
Kenwood Park	559	Linn	
Keokuk	15,229	Lee	***
Keosauqua	1,018	Van Buren	**
Keota	1,071	Keokuk	*
Keeley	175	Butler	***
Kewick	359	Keokuk	
Keystone	493	Benton	*
Keywest	100	Dubuque	
Kilbourn	50	Van Buren	
Kildutf	150	Jasper	
Kimballton	350	Audubon	*
Kingsley	1,052	Plymouth	***
Kingston	150	Des Moines	
Kinross	152	Keokuk	
Kirkman	198	Shelby	*
Kirkville	278	Wapello	
Kiron	239	Crawford	*
Kirmm	404	Hancock	*
Kline	10	Des Moines	
Klondike	50	Lyon	
Knierim	153	Calhoun	
Knoke	10	Calhoun	
Knowlton	181	Ringgold	
Knoxville	3,541	Marion	***
Knutsh	100	Des Moines	
Kosuta	50	Iowa	
Lacelle	25	Clarke	
Lacey	60	Mahaska	
Lacona	526	Warren	
LaCrew	30	Lee	
Laddsdale	200	Davis	
Ladora	215	Iowa	
Lafayette	25	Linn	
Lainsville	60	Jackson	
Lake City	2,224	Calhoun	**
Lake Mills	1,480	Winnebago	***
Lake Park	709	Dickinson	*
Lake View	814	Sac	***
Lakewood	25	Lyon	
Lakonta	50	Mahaska	
Lamoille	50	Marshall	
Lamoni	1,778	Decatur	***
Lamont	592	Buchanan	*
La Motte	298	Jackson	*

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Lancaster	50	Keokuk	
Lanesboro	206	Carroll	
Langdon	125	Clay	
Langworthy	60	Jones	
Lansing	1,655	Allamakee	**
Lanyon	50	Webster	
La Porte City	1,541	Black Hawk	***
Larchwood	476	Lyon	
Larrabee	192	Cherokee	
Latimer	357	Franklin	*
Latimers	43	Dubuque	
Laurel	194	Marshall	
Laurens	848	Pocahontas	****
Lavinia	50	Calhoun	
Lawler	656	Chickasaw	*
Lawnhill	20	Hardin	
Lawton	190	Woodbury	*
Lebanon	25	Van Buren	
Le Claire	688	Scott	
Ledyard	240	Kossuth	*
Lee	25	Ringgold	
Le Grand	364	Marshall	
Lehigh	1,290	Webster	**
Leighton	129	Mahaska	
Leland	188	Winnebago	
Le Mars	5,070	Plymouth	**
Lena	20	Webster	
Lenox	1,320	Taylor	***
Leon	2,190	Decatur	***
Le Roy	221	Decatur	
Leslie	25	Clarke	
Lester	274	Lyon	*
Letts	456	Louisa	
Leverett	25	Buena Vista	
Levey	50	Polk	
Lewis	652	Cass	*
Lexington	20	Washington	
Liberty	25	Clarke	
Liberty Center	75	Warren	
Libertyville	200	Jefferson	
Liddersdale	176	Carroll	
Lima	25	Fayette	
Lime Springs	547	Howard	*
Linby	26	Jefferson	
Lincoln	10	Grundy	
Linden	324	Dallas	
Lineville	752	Wayne	
Linn Grove	320	Buena Vista	*
Linn Junction	10	Linn	
Lisbon	879	Linn	***
Liscomb	307	Marshall	
Little Cedar	200	Mitchell	
Little Port	206	Clayton	
Little Rock	634	Lyon	**
Little Sioux	452	Harrison	
Littleton	94	Buchanan	
Little Turkey	25	Chickasaw	
Livermore	634	Humboldt	**
Livingston	10	Appanoose	
Lockman	500	Monroe	
Lockridge	203	Jefferson	
Logan	1,641	Harrison	**
Lohrville	696	Calhoun	*
Lone Rock	150	Kossuth	
Lone Tree	809	Johnson	*
Long Grove	146	Scott	
Lorah	24	Cass	
Lore	75	Dubuque	
Lorimor	711	Union	
Lost Nation	577	Clinton	*
Lotts Creek	10	Kossuth	
Louisa	15	Linn	
Lourdes	30	Howard	
Loveland	25	Pottawattamie	
Lovilia	521	Monroe	
Lowden	630	Cedar	*
Lowell	100	Henry	
Low Moor	263	Clinton	*

Name of City, Town or Village	Population Census 1915	County	Re
Luana	168	Clayton	
Lucas	625	Lucas	
Ludlow	27	Allamakee	
Lundgren	10	Webster	
Luther	141	Boone	*
Luton	250	Woodbury	
La Verne	500	Kossuth	*
Luxemburg	120	Dubuque	
Luzerne	161	Benton	
Lyman	15	Cass	
Lynnville	453	Jasper	
Lytton	238	Sac	
McArthurs	10	Scott	
McCallsburg	292	Story	
McCausland	110	Scott	
McClelland	144	Pottawattamie	
McGregor	1,244	Clayton	**
McIntire	579	Mitchell	
McPaul	25	Fremont	
Macedonia	390	Pottawattamie	*
Mackey	14	Boone	
Macksburg	304	Madison	
Madrid	1,449	Boone	**
Magill	20	Harrison	
Magnolia	297	Harrison	
Malcom	426	Poweshiek	*
Mallard	384	Palo Alto	*
Malone	40	Clinton	
Maloy	119	Ringgold	
Malvern	1,254	Mills	**
Manchester	3,102	Delaware	**
Manilla	1,124	Crawford	*
Manly	982	Worth	*
Manning	1,611	Carroll	**
Manson	1,309	Calhoun	*
Maple Hill	10	Emmet	
Maple Landing	10	Monona	
Mapleleaf	10	Howard	
Maple River	20	Carroll	
Mapleton	1,200	Monona	***
Maquoketa	3,776	Jackson	**
Marathon	581	Buena Vista	*
Marble Rock	533	Floyd	**
Marcus	987	Cherokee	***
Marengo	2,037	Iowa	**
Marion	4,675	Linn	***
Mark	43	Davis	
Marne	297	Cass	*
Marquisville	50	Polk	
Marsh	50	Louisa	
Marshalltown	16,065	Marshall	**
Martelle	181	Jones	
Martensdale	50	Warren	
Martinsburg	288	Keokuk	
Marysville	216	Marion	
Mason City	17,152	Cerro Gordo	***
Masonville	268	Delaware	
Masters	546	Cass	
Massey	40	Dubuque	
Massillon	75	Cedar	
Matlock	78	Sioux	
Maud	10	Allamakee	
Maurice	307	Sioux	
Maxwell	856	Story	*
May City	25	Osceola	
Maynard	426	Fayette	*
Maysville	58	Scott	
Mechanicsville	816	Cedar	*
Mederville	75	Clayton	
Mediapolis	867	Des Moines	**
Medora	15	Warren	
Melbourne	359	Marshall	
Melcher	560	Marion	
Melrose	469	Monroe	
Meltonville	30	Worth	
Melvin	278	Osceola	
Menlo	437	Guthrie	
Meriden	263	Cherokee	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Meron	25	Mitchell	
Merrill	536	Plymouth	****
Merrimac	10	Jefferson	
Meservey	257	Cerro Gordo	****
Metz	25	Jasper	
Meyer	421	Mitchell	
Middle Amana	400	Iowa	
Middleburg	10	Sioux	
Middle River	30	Madison	
Middleton	126	Des Moines	
Midway	50	Woodbury	
Miles	316	Jackson	*
Milford	823	Dickinson	***
Miller	50	Hancock	
Millersburg	197	Iowa	
Millville	100	Clayton	
Milo	607	Warren	
Milton	947	Van Buren	
Minburn	430	Dallas	
Minden	429	Pottawattamie	*
Mineola	300	Mills	
Mineral Ridge	30	Boone	
Minerva	20	Marshall	
Mingo	305	Jasper	
Missouri Valley	3,764	Harrison	***
Mitchell	225	Mitchell	
Mitchellville	816	Polk	
Modale	406	Harrison	
Moingona	100	Boone	
Mona	100	Mitchell	
Mondamin	452	Harrison	
Monita	88	O'Brien	
Monmouth	224	Jackson	
Monona	966	Clayton	*
Monroe	926	Jasper	
Montieth	60	Guthrie	
Monterey	75	Davis	
Montezuma	1,326	Poweshiek	***
Montgomery	100	Dickinson	**
Monticello	2,159	Jones	*
Montour	413	Tama	
Montpelier	50	Muscatine	
Montrose	702	Lee	
Moorland	300	Lee	
Moorhead	49	Tama	
Moorehead	381	Monona	*
Moorland	157	Webster	*
Moran	50	Dallas	
Moravia	741	Appanoose	
Morgan	18	Decatur	
Morgan Valley	10	Marion	
Morley	150	Jones	
Morning Sun	904	Louisa	*
Morrison	218	Grundy	
Morse	91	Johnson	
Mortons	20	Mills	
Moscow	100	Muscatine	
Motor	15	Warren	
Moulton	1,352	Appanoose	
Mt. Auburn	273	Benton	
Mount Ayr	1,708	Ringgold	***
Mt. Carmel	72	Carroll	
Mount Etna	73	Adams	
Mount Hamill	100	Lee	
Mount Joy	20	Scott	
Mt. Olive	10	Cherokee	
Mount Pleasant	4,089	Henry	***
Mount Sterling	243	Van Buren	
Mount Union	200	Henry	
Mount Valley	21	Winnebago	
Mount Vernon	1,568	Linn	***
Mount Zion	77	Van Buren	*
Morrill	801	Woodbury	
Munterville	25	Wapello	
Murray	847	Clarke	
Muscatine	15,785	Muscatine	
Myrtle	10	Muscatine	
Mystic	2,695	Appanoose	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. **
Napier	12	Boone	
Nashua	1,282	Chickasaw	**
Nashville	75	Jackson	
National	125	Clayton	
Nelle	10	Winnebago	
Nemaha	150	Sac	
Neola	977	Pottawattamie	*
Neptune	15	Plymouth	
Nevada	2,886	Story	***
Nevinville	75	Adams	
New Albin	613	Allamakee	
Newbern	100	Marion	
New Boston	75	Lee	
Newburg	100	Jasper	
Newell	787	Buena Vista	*
Newhall	248	Benton	
New Hampton	2,664	Chickasaw	***
New Hartford	474	Butler	*
New Haven	100	Mitchell	
Newkirk	20	Sioux	
New Liberty	116	Scott	
New London	1,162	Henry	*
New Market	737	Taylor	
Newport	35	Louisa	
New Providence	249	Hardin	
New Sharon	1,123	Mahaska	**
Newton	5,165	Jasper	***
New Vienna	211	Dubuque	*
New Virginia	409	Warren	
New York	10	Wayne	
Nichols	425	Muscatine	
Nilesville	20	Floyd	
Nira	35	Washington	
Noble	30	Washington	
Nodaway	389	Adams	
Noel	35	Scott	
Nora Junction	15	Floyd	
Nora Springs	1,148	Floyd	**
Nordness	100	Winnoshiek	
Norman	105	Winnebago	
Northboro	219	Page	
North Branch	75	Guthrie	
North Buena Vista	164	Clayton	
North English	933	Iowa	*
Northfield	10	Des Moines	
North Liberty	186	Johnson	
North McGregor	575	Clayton	*
North Tabor	100	Mills	
North Washington	123	Chickasaw	
Northwood	1,525	Worth	***
Norwalk	359	Warren	
Norway	453	Benton	*
Norwich	30	Page	
Norwood	46	Lucas	
Norwoodville	200	Polk	
Nugent	10	Keokuk	
Numa	738	Appanoose	
Nyman	30	Page	
Oakdale (State Hospital)	200	Johnson	***
Oakland	1,196	Pottawattamie	**
Oakland Mills	150	Henry	
Oakley	150	Lucas	
Oakville	416	Louisa	
Oasis	75	Johnson	
Ocheydan	725	Osceola	*
Odebolt	1,236	Sac	***
Oelwein	7,137	Fayette	***
Ogden	1,403	Boone	***
Okoboji	40	Dickinson	
Old	163	Henry	
O'Leary	12	Plymouth	
Olin	706	Jones	**
Olivet	62	Mahaska	
Ollie	341	Keokuk	
Onawa	2,210	Monona	***
Oneida	145	Delaware	
Oneida Junction	150	Delaware	
O'Neill	25	Dubuque	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Onslow	231	Jones	*
Ontario	75	Story	
Oriabor	300	Polk	
Oran	100	Fayette	
Orange City	1,417	Sioux	***
Orchard	141	Mitchell	
Orient	496	Adair	
Orleans	135	Dickinson	
Orson	75	Harrison	
Ortonville	10	Dallas	
Osage	2,779	Mitchell	****
Osborne	50	Clayton	
Osceola	2,714	Clarke	***
Osgood	75	Palo Alto	
Oskaloosa	10,483	Mahaska	***
Ossian	835	Winneshiek	
Osterdock	97	Clayton	
Oswalt	35	Jasper	
Otho	100	Webster	
Otis	10	Linn	
Otley	200	Marion	
Oto	366	Woodbury	*
Otranto Station	100	Mitchell	
Otter Creek	20	Jackson	
Otterville	100	Buchanan	
Ottosen	153	Humboldt	
Ottumwa	22,437	Wapello	**
Owasa	100	Hardin	
Oxford	577	Johnson	*
Oxford Junction	852	Jones	****
Oxford Mills	50	Jones	
Oyens	82	Plymouth	
Pacific City	35	Mills	
Pacific Junction	660	Mills	
Packard	20	Butler	
Packwood	295	Jefferson	
Page	100	Page	
Palmer	222	Pocahontas	*
Palmyra	25	Warren	
Palo	222	Linn	
Panama	168	Shelby	****
Panora	1,107	Guthrie	
Panther	20	Dallas	
Paradise	10	Jackson	
Paralta	25	Linn	
Paris	20	Linn	
Parkersburg	1,027	Butler	**
Parnell	380	Iowa	
Parrish	10	Des Moines	
Paton	359	Greene	
Patterson	132	Madison	
Paullina	875	O'Brien	***
Pedro	25	Woodbury	
Pekin	20	Keokuk	
Pella	3,096	Marion	**
Peoria	20	Mahaska	
Peosta	100	Dubuque	
Percival	100	Fremont	
Percy	150	Marion	
Perkins	25	Sioux	
Perlee	18	Jefferson	
Perry	5,455	Dallas	**
Persia	383	Harrison	*
Petersburg	50	Delaware	
Peterson	534	Clay	**
Petersville	75	Clinton	
Phildia	500	Dallas	
Pierson	499	Woodbury	*
Pilotburg	10	Washington	
Pilot Grove	150	Lee	
Pilot Mound	347	Boone	
Pine Mills	10	Muscatine	
Pioneer	108	Humboldt	
Piper	23	Calhoun	
Pisgah	403	Harrison	
Pittsburg	75	Van Buren	
Pitzer	30	Madison	
Plainfield	325	Bremer	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Plainview	20	Scott	
Plano	150	Appanoose	
Plato	20	Cedar	
Plattville	40	Taylor	
Pleasant Creek	10	Jackson	
Pleasant Grove	30	Des Moines	
Pleasanton	265	Decatur	
Pleasant Plain	172	Jefferson	
Pleasant Prairie	25	Muscatine	
Pleasant Valley	25	Scott	
Pleasantville	825	Marion	*
Pluma	30	O'Brien	
Pluser	250	Pocahontas	
Plymouth	374	Cerro Gordo	
Pocahontas	1,194	Pocahontas	*
Polen	35	Ringgold	
Polk City	257	Polk	
Pomeroy	935	Calhoun	*
Popejoy	238	Franklin	
Poplar	10	Audubon	
Portland	100	Cerro Gordo	
Port Louisa	35	Wapello	
Portsmouth	338	Shelby	*
Postville	1,003	Allamakee	***
Powersville	60	Floyd	
Prairieburg	227	Linn	*
Prairie City	817	Jasper	*
Prescott	453	Adams	
Preston	654	Jackson	
Primghar	923	O'Brien	***
Primrose	300	Lee	
Princeton	428	Scott	
Prole	25	Warren	
Promise City	278	Wayne	
Protivin	185	Howard	*
Pulaski	476	Davis	
Quandahl	20	Allamakee	
Quarry	25	Dallas	
Quarry	50	Marshall	
Quasqueton	466	Buchanan	
Quimby	286	Cherokee	
Quincy	77	Adams	
Radcliffe	729	Hardin	*
Rake	231	Winnebago	
Ralston	200	Carroll	
Randalia	141	Fayette	
Randall	150	Hamilton	
Randolph	320	Fremont	
Rands	35	Calhoun	
Rathbun	622	Appanoose	
Ray	32	Appanoose	
Raymond	100	Black Hawk	
Read	50	Clayton	
Readlyn	319	Bremer	*
Reamer	205	Jasper	
Redding	292	Ringgold	
Redfield	669	Dallas	*
Red Oak	5,601	Montgomery	**
Reeder Mills	20	Harrison	
Reinbeck	1,257	Grundy	***
Rembrandt	228	Buena Vista	
Remsen	1,098	Plymouth	***
Renwick	483	Humboldt	*
Rhodes (Edenville)	448	Marshall	*
Ricesville	945	Mitchell	***
Richards	25	Calhoun	
Richfield	25	Fayette	
Rickland	619	Keokuk	
Richmond	100	Washington	
Richardsville	95	Dubuque	
Ricketts	143	Crawford	*
Ridgeway	389	Winneshiek	
Riggs	25	Clinton	
Rinard	156	Calhoun	
Ringgold	10	Ringgold	
Ringsted	447	Emmet	*
Ripley	403	Greene	*
Rising Sun	75	Polk	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
River Junction	75	Johnson	
Riverside	656	Washington	*
River Sioux	85	Harrison	
Riverton	654	Fremont	
Riverview	20	Scott	
Riverview	200	Wapello	
Riserville	100	Monroe	
Robertson	20	Hardin	
Robins	125	Linn	
Robinson	50	Delaware	
Rochester	150	Cedar	
Rockaway	10	Jackson	
Rock Branch	75	Woodbury	
Rockdale Mills	150	Dubuque	
Rock Falls	108	Cerro Gordo	
Rockford	1,138	Floyd	*
Rock Rapids	2,031	Lyon	**
Rock Valley	1,306	Sioux	*
Rockwell	726	Cerro Gordo	****
Rockwell City	1,864	Calhoun	***
Rodman	161	Palo Alto	
Rodney	175	Monona	
Roelyn	40	Webster	
Roland	691	Story	*
Rolfe	1,115	Pocahontas	***
Rome	163	Henry	
Rorbeck	10	Shelby	
Roscoe	15	Des Moines	
Rosehill	257	Mahaska	
Roselle	100	Carroll	
Rosendale	12	Boone	
Ross	70	Audubon	
Rossie	50	Clay	
Rossville	50	Allamakee	
Rowan	326	Wright	
Rowley	350	Buchanan	
Royal	312	Clay	
Ruble	100	Washington	
Rudd	448	Floyd	
Runnells	390	Polk	
Russell	660	Lucas	
Ruthven	744	Palo Alto	*
Rutland	235	Humboldt	
Rutledge	25	Wapello	
Ryan	483	Delaware	*
Sabula	944	Jackson	*
Sac City	2,521	Sac	**
Salem	516	Henry	
Saline	50	Jefferson	
Salix	339	Woodbury	*
Sanborn	1,456	O'Brien	***
Sandspring	30	Delaware	
Sandusky	100	Lee	
Sandyville	110	Warren	
Santiago	20	Polk	
Saratoga	72	Howard	
Satire	15	Winneshiek	
Saude	25	Chickasaw	
Savannah	76	Davis	
Sawyer	50	Lee	
Saylor	20	Polk	
Scarville	162	Winnebago	
Schaller	680	Sac	***
Schleswig	567	Crawford	*
Schley	50	Howard	
Scioto	75	Montgomery	
Scotch Grove	100	Jones	
Scranton	903	Greene	*
Searsboro	207	Poweshiek	
Sedan	20	Appanoose	
Seevers	150	Jasper	
Selma	200	Van Buren	
Seneca	10	Kossuth	
Seney	40	Plymouth	
Sergeant Bluff	507	Woodbury	
Sewal	75	Wayne	
Sexton	50	Kossuth	
Seymour	2,146	Wayne	***

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Shaffton	15	Clinton	
Shambaugh	298	Page	
Shannon City	189	Union	
Sharon Center	70	Johnson	
Sharpsburg	166	Taylor	
Sheffield	1,033	Franklin	***
Shelby	623	Shelby	
Sheldahl	226	Polk	
Sheldon	3,323	O'Brien	***
Shell Rock	829	Butler	**
Shellsburg	696	Benton	*
Shenandoah	5,637	Page	**
Shepard	10	Union	
Sherrill	123	Dubuque	
Sherwin	30	Calhoun	
Shipley	10	Story	
Shoecraft	10	Jackson	
Shueyville	100	Johnson	
Sian	75	Taylor	
Sibley	1,755	Osceola	***
Sidney	1,074	Fremont	*
Sigourney	2,109	Keokuk	***
Silver City	483	Mills	
Sinclair	20	Butler	
Sioux Center	1,209	Sioux	
Sioux City	81,774	Woodbury	**
Sioux Rapids	1,023	Buena Vista	**
Slater	670	Story	*
Slifer	20	Webster	
Sloan	588	Woodbury	*
Smithland	336	Woodbury	*
Smyrna	20	Clarke	
Soldier	244	Monona	*
Solon	441	Johnson	*
Somers	178	Calhoun	
South Amana	100	Iowa	
South English	333	Keokuk	
Spaulding	50	Union	
Specht's Ferry	25	Dubuque	
Spencer	4,176	Clay	**
Sperry	50	Des Moines	
Spillville	314	Winneshiek	
Spirit Lake	1,602	Dickinson	***
Spragueville	101	Jackson	
Spring Brook	130	Jackson	
Springdale	175	Cedar	
Spring Hill	85	Warren	
Springville	637	Linn	*
St. Ansgar	852	Mitchell	*
St. Anthony	218	Marshall	
St. Benedict	100	Kossuth	
St. Charles	455	Madison	
St. Donatus	100	Jackson	
St. Joseph	25	Kossuth	
St. Lucas	148	Fayette	
St. Mary's	35	Warren	
St. Olaf	145	Clayton	
St. Paul	62	Lee	
St. Sebald	50	Clayton	
Stacyville	696	Mitchell	
Stanhope	357	Hamilton	
Stanley	160	Buchanan	
Stanton	705	Montgomery	*†
Stanwood	547	Cedar	*
State Center	1,037	Marshall	***
Steamboat Rock	414	Hardin	
Stennett	125	Montgomery	
Sterling	30	Jackson	
Stiles	110	Davis	
Stilson	35	Hancock	
Stockport	263	Van Buren	
Stockton	121	Muscatine	
Stone City	75	Jones	
Storm Lake	3,158	Buena Vista	***
Story City	1,576	Story	*
Strat	147	Grundy	
Strahan	200	Mills	
Stratford	601	Hamilton	***

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Strawberry Point	1,157	Clayton	***
Struble	160	Plymouth	
Stuart	1,549	Guthrie	***
Sully	346	Jasper	*
Sulphur Springs	50	Buena Vista	
Summerset	15	Warren	
Summit	10	Muscatine	
Summitville	200	Lee	
Sumner	1,585	Bremer	***
Sunbury	200	Cedar	
Superior	188	Dickinson	
Sutherland	812	O'Brien	***
Swaledale	207	Cerro Gordo	
Swan	271	Marion	
Swanton	10	Butler	
Swea City	595	Kossuth	*
Swedesburg	150	Henry	
Sweetland	15	Muscatine	
Sylvia	25	Linn	
Tabor	1,048	Fremont	*
Talmage	100	Mahaska	
Talleyrand	30	Keokuk	
Talmage	50	Union	
Tama	2,621	Tama	**
Tara	40	Webster	
Toeda Grove	200	Clinton	
Temple Hill	10	Jones	
Templeton	276	Carroll	*
Tennant	100	Shelby	
Tenold	17	Worth	
Terrill	452	Dickinson	*
Thayer	188	Union	
Thompson	565	Winnebago	***
Thor	297	Humboldt	
Thornburg	221	Keokuk	
Thornton	311	Cerro Gordo	
Thorpe	100	Delaware	
Thurman	357	Fremont	
Ticonic	50	Monona	
Tiffin	196	Johnson	
Tilton	75	Powshiek	
Tingley	411	Ringgold	
Tioga	40	Mahaska	
Tipton	2,176	Cedar	***
Tidonka	353	Kossuth	
Titus	10	Washington	
Toddville	50	Linn	
Toeterville	100	Mitchell	
Toledo	1,721	Tama	***
Toolsboro	75	Louisa	
Toronto	141	Clinton	
Tracy	300	Marion	
Traer	1,278	Tama	***
Trenton	250	Henry	
Treynor	205	Pottawattamie	
Tripoli	854	Bremer	***
Troy	200	Davis	
Troy Mills	150	Linn	
Truesdale	150	Buena Vista	
Truro	322	Madison	
Turin	202	Monona	
Turkey River	75	Clayton	
Turkey River Junction	10	Clayton	
Turner	25	Jasper	
Tuskego	20	Decatur	
Tyrone	50	Monroe	
Udell	192	Appanoose	
Ulmer	75	Sac	
Underwood	295	Pottawattamie	*
Union	600	Hardin	***
Unionville	300	Appanoose	
Unique	10	Humboldt	
University Park	435	Mahaska	
Urbana	393	Benton	*
Ute	560	Monona	*
Utica	35	Van Buren	
Vail	685	Crawford	*
Valeria	92	Jasper	

Name of City, Town or Village	Population Census 1915	County	See Note Expl. ***
Valley	20	Washington	
Valley Junction	3,026	Polk	***
Vanclove	30	Marshall	
Vandalia	25	Jasper	
Van Horn	505	Benton	
Van Meter	472	Dallas	
Van Wert	461	Decatur	
Varina	245	Pocahontas	
Ventura	250	Cerro Gordo	
Veo	12	Jefferson	
Verdi	12	Washington	
Vernon	249	Van Buren	
Victor	754	Iowa	***
Viele	50	Lee	
Villisca	2,132	Montgomery	**
Vilmar	20	Butler	
Vincennes	150	Lee	
Vincent	183	Webster	
Vining	154	Tama	
Vinje	23	Winnebago	
Vinton	3,995	Benton	**
Viola	100	Linn	
Viola Center	30	Audubon	
Vista	25	Buchanan	
Volga	456	Clayton	
Volney	10	Allamakee	
Voorhies	200	Black Hawk	
Wadena	279	Fayette	
Walcott	461	Scott	***
Wales	27	Montgomery	
Walford	150	Benton	
Walker	526	Linn	*
Wallace	12	Dickinson	
Wallingford	188	Emmet	
Wall Lake	726	Sac	*
Walnut	1,008	Pottawattamie	*
Walnut City	20	Appanoose	
Waneta	12	Davis	
Wapello	1,512	Louisa	**
Ward	400	Monroe	
Ware	180	Pocahontas	
Warren	36	Lee	
Washburn	125	Black Hawk	
Washington	4,544	Washington	**
Washington Mills	30	Dubuque	
Washta	422	Cherokee	
Waterloo	33,097	Black Hawk	**
Waterville	192	Allamakee	
Watkins	100	Benton	
Watson	50	Clayton	
Watterson	10	Ringgold	
Waubeck	75	Linn	
Waucoma	449	Fayette	
Waukee	354	Dallas	
Waukon	2,168	Allamakee	***
Waukon Jct.	30	Bremer	
Waupeton	25	Dubuque	
Waverly	3,561	Bremer	**
Wayland	560	Henry	
Wayne	50	Henry	
Webb	185	Clay	
Webster	126	Keokuk	
Webster City	5,834	Hamilton	**
Weldon	289	Decatur	
Wellman	839	Washington	**
Wellsburg	583	Grundy	*
Welton	75	Clinton	
Wesley	466	Kossuth	*
West Amana	175	Iowa	
West Bend	701	Palo Alto	*
West Branch	712	Cedar	****
West Burlington	1,091	Des Moines	***
West Chester	233	Washington	
Western College	20	Linn	
Westerville	35	Decatur	
Westfield	198	Plymouth	
Westgate	266	Fayette	*
West Grove	175	Davis	

Name of City Town, or Village	Population Census 1915	County	See Note Expl. ***
West Liberty	1,760	Muscatine	***
West Mitchell	138	Mitchell	
Westphalia	100	Shelby	
West Point	564	Lee	
West Side	401	Crawford	*
West Union	1,773	Fayette	***
Wever	175	Lee	
What Cheer	1,805	Keokuk	**
Wheatland	558	Clinton	*
White Pigeon	10	Keokuk	
Whiting	642	Monona	
Whittemore	588	Kossuth	*
Whitten	236	Hardin	
Whittier	50	Linn	
Wichita	16	Guthrie	
Wick	25	Warren	
Wightman	20	Calhoun	
Wilke	25	Hardin	
Willey	71	Carroll	
Williams	550	Hamilton	*
Williamsburg	1,157	Iowa	****
Williamstown	25	Chickasaw	
Wilton	1,176	Muscatine	***
Windham	35	Johnson	
Winfield	1,007	Henry	*
Winslow	30	Black Hawk	
Winterset	2,860	Madison	****
Winthrop	564	Buchanan	*
Wiota	245	Cass	
Wolfe	163	Hancock	
Wood	50	Clayton	
Woodbine	1,613	Harrison	**
Woodburn	389	Clarke	
Woodland	50	Decatur	
Woodward	820	Dallas	****
Woolson	15	Jefferson	
Woolstock	337	Wright	
Worthington	347	Dubuque	
Wright	100	Mahaska	
Wyman	100	Louisa	
Wyoming	707	Jones	*
Yale	305	Guthrie	*
Yarmouth	125	Des Moines	
Yetter	132	Calhoun	
Yorkshire	25	Harrison	
Yorktown	212	Page	
Youngstown	30	Polk	
Zaneta	20	Grundy	
Zearing	536	Story	
Zenorsville	12	Boone	
Zwingle	85	Dubuque	

Cities of the 1st Class	15
Cities of the 2nd Class	90
Towns	792
Villages	777
Total	1,674

From the above list as compiled, the following summary may be made:

Total number of cities, towns and villages	1,674
Total number of cities and towns having public water supply	473
Total number of cities and towns having public water supply and sewers	215
Total number of cities and towns that have installed sewage treatment plants	113
Total number of cities and towns that have plans prepared for sewers and sewage treatment plants	20

The purpose in compiling the above list is to obtain as complete a list as possible of all of the centers of population in the state where more than a few persons, or more than one family of persons live. It may be true that a few such centers of population have been overlooked in this compilation. Several of the places mentioned are old towns in their decay. A number of the towns mentioned are new places that are destined to have considerable growth.

At the present time the tendency to modern sanitary installations in the home is so great that the residence becomes the unit, rather than the town or city. It is therefore true that any center of population comprising two or more residences may desire a water supply and a means of sewage disposal. Except in isolated locations residential disposal plants are not recommended, and in all centers of population, no matter how small, the economic plan is the common disposal plant. The smaller towns seem to be more eager for sanitary installations than many of the larger towns. This tendency indicates that in the very near future practically all centers of population will be supplied with the necessary sanitary installations.

The following classification of the cities, towns and villages of Iowa above listed, according to population listed, will be found a convenient classification with reference to sanitary installations at the present time.

Towns and villages having a population up to 100	592
Towns and villages having a population 100-500	644
Towns and villages having a population 500-800	170
Cities, towns and villages having a population 800 and over	268
Total	1,674

Cities and towns having public water supply only (1)	241
Cities and towns having public water supply and sewers only (2)	103
Cities and towns having public water supply, sewers and sewage treatment plants (3)	113
Cities and towns having public water supply, and have plans prepared for sewers and sewage treatment plants	20
Total number of public water supplies (sum of 1, 2, 3, 4)	473
Total number of sewer installations (sum of 2, 3)	215
Total number of sewage treatment plants	113
Total number of cities and towns that have prepared plans for future installation of sewers and sewage treatment plants	20
Cities and towns of 800 population and over having public water supply	252

Towns of 500-800 population having public water supply	112
Towns of less than 500 population having public water supply	108
Total	473
Cities and towns of 800 population and over having sewers without sewage treatment plants	90
Towns of 500-800 population having sewers without sewage treatment plants	11
Towns of less than 500 population having sewers without sewage treatment plants	2
Total number of cities and towns having sewers without sewage treatment plants	103
Cities and towns of 800 population and over having sewers and sewage treatment plants	95
Towns of 500-800 population having sewers and sewage treatment plants	14
Towns of less than 500 population having sewers and sewage treatment plants	4
Total number of cities and towns having sewers and sewage treatment plants	113
Cities and towns of 800 population and over having plans prepared for sewers and sewage treatment plants	12
Towns of 500-800 population having plans prepared for sewers and sewage treatment plants	5
Towns of less than 500 population having plans prepared for sewers and sewage treatment plants	3
Total number of cities and towns that have prepared plans for future installation of sewers and sewage treatment plants	20
Smallest town having public water supply has a population of	108
Smallest town having public water supply and sewers has a population of	475
Smallest town having public water supply, sewer and sewage treatment plant has a population of	461

SEWAGE POLLUTION OF STREAMS.

In the foregoing list of Iowa municipalities one hundred three (103) cities and towns are indicated as having sewers without sewage treatment. The sewage thus discharged represents serious stream pollution and consequent pollution of public water supplies in many instances.

The total population of the municipalities thus polluting the streams is 680,831, or 28.86% of the total population of the state, or 53.28% of the urban population of the state.

One hundred thirteen (113) cities and towns have provided sewage treatment in connection with sewer systems. With proper care the sewage treatment thus provided will protect the outfall streams from sewage pollution. Such municipalities represent approximately 10% of the total population of the state, or approximately 19% of the urban population of the state.

Many of the unincorporated communities, legally designated as villages, also contribute directly to the sewage pollution of streams.

The approximate population of such community centers is 60,852. Of this population 41,652 reside in villages of a population of 100 or more and should be considered as urban population contributing to the sewage pollution of streams.

This would make the total urban population contributing to sewage pollution of streams 722,483, or 30.66% of the total population of the state, or 54.78% of the urban population of the state.

It will be remembered that villages have no statutory method of financing public improvements, therefore all villages with the requisite number of electors should become incorporated towns in order that necessary sanitary installations may be provided for the use of their inhabitants.

Sanitary surveys.

Afton	Marcus
Boone	Melcher
Calmar	Milford
Creston	Newton
George	Rexton
Gilmore City	Rock Valley
Graettinger	Story City
High Bridge	Ward
Indianola	Winterset

LABORATORY WORK

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

HENRY ALBERT.
Director of the Laboratory

During the past biennial period, the work of the laboratories for the State Board of Health has been considerably increased in spite of the fact that there has been more or less interference as a result of developments in connection with the war. The war has affected the work of the laboratory principally because of the marked increase in the cost of practically everything used in connection with laboratory work. In some instances the cost of articles has been more than trebled.

LABORATORY STAFF.

Several changes have occurred in connection with the laboratory staff during the biennial period. Dr. M. F. Boyd who had served as epidemiologist since 1915, resigned November 1, 1917, to accept the position of Professor of Bacteriology and Hygiene in the University of Texas. He was succeeded by Dr. John H. Hamilton who is a graduate of Harvard University Medical School, and who was for the past year connected with the New York State Board of Health. Dr. Hamilton began service February 1, 1918. During the interval between the leaving of Dr. Boyd and the arrival of Dr. Hamilton, Dr. C. B. McGlumphy of the teaching staff of the department of pathology and bacteriology, served as acting epidemiologist.

Dr. Chester E. Demaree resigned April 1, 1918, as bacteriologist to enter the practice of medicine. He was succeeded by Mr. William E. Burns. Several months ago, Dr. G. H. Sumner, Secretary-Executive Officer of the State Board of Health in furtherance of the plan to control venereal diseases in the state, conferred with the Director regarding the making of Wassermann tests in the laboratory. Because of the failure on the part of the last legislature to make provision for such examinations, it was not possible to under-

take such work without additional funds. Dr. Sumner took the matter up with the Surgeon-General of the U. S. Public Health Service, as the result of which and through arrangement made with Dr. W. C. Witte of the Public Health Service, Miss Eva M. Bruett arrived at the laboratory on June 17, 1918. Steps were taken to prepare for Wassermann examinations on a large scale and the first series of examinations were reported on July 11. The laboratory is now prepared to perform the Wassermann tests on a rather extensive scale.

BRANCH LABORATORIES.

The work of the branch laboratories of the State Board of Health has been considerably interfered with by the entry of a number of the bacteriologists in charge into the medical service of the army. Those who have entered the service are: Dr. F. H. Lamb, Davenport; Dr. Guthrie McConnell, Waterloo; Dr. James Christiansen, Sioux City; Dr. E. H. Wehman, Burlington; and Dr. D. J. Glomset, Des Moines. Their work is now being done by successors who are serving as acting bacteriologists. The branch laboratories of the State Board of Health are not supported from funds of the main laboratory or by the State Board of Health, although they are supplied with mailing cases and report blanks from the main laboratory. They are established with the idea of bringing the service of the laboratory as near as possible to the people to be served. Their examinations are recognized as official by the State Board of Health. The branch laboratories are located at the following places and in charge of the persons named:

Davenport—Dr. F. H. Lamb.
Sioux City—Dr. James Christiansen.
Waterloo—Dr. Guthrie McConnell.
Burlington—Dr. E. J. Wehman
Cedar Rapids—Dr. James G. Ware.
Des Moines—Dr. D. J. Glomset.
Ames—Dr. R. E. Buchanan.
Little Rock—Dr. Ferdinand Smith.
Mason City—Dr. A. C. Echternacht.

WORK OF THE LABORATORIES.

The work of the laboratories for the State Board of Health is divided into four divisions as follows:

A. Diagnostic Division.
B. Immunization Division.
C. Water Analysis Division.
D. Epidemiological Division.

To these will temporarily be added the Venereal or Wassermann

Division. No doubt permanent provision for this last named division will be made by the next legislature. The work of the four divisions will be considered separately.

WORK OF THE DIAGNOSTIC DIVISION.

The work of this division consists principally of routine bacteriological diagnoses of diphtheria, tuberculosis, typhoid fever (Widal tests) and rabies. Various miscellaneous specimens are also examined from time to time.

I. DIPHTHERIA EXAMINATIONS.

During the past biennium a total of 17,483 diphtheria specimens (throat cultures) were examined, of which 3,090 were examined for diagnosis, 5,525 for release from quarantine, 8,675 for recognition of diphtheria bacilli carriers and 93 virulence tests. The recognition of diphtheria bacilli carriers was done principally in connection with the investigation of epidemics of the disease. It is one of the most effective means which we have for the control of epidemics. Examinations for such should be begun as soon as possible after an outbreak begins and before it has assumed extensive epidemic form. A detailed analysis of the diphtheria specimens examined is presented in the following table:

TABLE 1. SPECIMENS RECEIVED FOR DIPHTHERIA EXAMINATION.

	Positive	Negative	Diagnosis Reserv.	Specimens Unsuitable for Examin.	Total
Diagnosis—					
1916-1917	258	1,146	34	23	1,461
1917-1918	426	1,162	14	17	1,629
Total	684	2,308	48	40	3,090
Release—					
1916-1917	746	1,337	53	26	2,156
1917-1918	908	2,404	8	31	3,369
Total	1,608	3,843	61	57	5,525
Carrier—					
1916-1917	393	4,900	96	4	5,393
1917-1918	101	3,101	7	15	3,324
Total	494	8,001	101	19	8,675
Virulence Tests—					
1916-1917	28	22	0	0	50
1917-1918	25	18	0	0	43
Total	52	40	0	0	93

Grand total: 1916-1917, 9,059; 1917-1918, 8,335-17,383.

II. TYPHOID FEVER.

During the biennium 3,454 specimens of blood were examined for the Widal reaction. Of these 495 were positive, 2,426 negative and 518 questionable. During the same period 79 specimens of feces and urine were examined for typhoid bacilli. The organism was found seven times. Although the Widal test continues to be the most practical laboratory

test for the diagnosis of typhoid fever, its value is, however, somewhat restricted because the reaction is seldom positive before the seventh day of the disease.

The cultural method of examining feces for typhoid bacilli has been used principally for the detection of carriers in connection with outbreaks or epidemics of typhoid fever. For the transmission of specimens of feces and urine for examination for typhoid bacilli a special container has been provided. It is to be hoped that the facilities of the laboratory may be sufficiently extended so that the cultural method may be more extensively used in connection with the diagnosis of the disease in its early stages. A tabulated summary of the results obtained in connection with the examinations of blood, feces and urine for typhoid fever is given in Table 2.

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

	Positive	Negative	Diagnosis Reserv.	Specimens Unsuitable for Exam.	Total
Widal—					
1916-1917	208	1,356	302	8	1,874
1917-1918	227	1,070	216	7	1,520
Total	495	2,426	518	15	3,454
Cultural Examinations—Feces and Urine—					
1916-1917	3	19	9	0	31
1917-1918	4	18	26	0	48
Total	7	37	35	0	79

Grand Total: 1916-1917, 1,905; 1917-1918, 1,568, 3,533.

III. PARATYPHOID FEVER.

During the past few years evidence has been accumulating to indicate that paratyphoid fever is very much more prevalent in this state than is usually believed to be the case. Although we have had suspicious evidence of paratyphoid fever in connection with a number of ag glutination tests, the more positive evidence indicated by cultural examinations have been limited to examination of three specimens as is shown in Table 3. The Bacillus para typhosus A was found twice.

TABLE 3. SPECIMENS OF FECES RECEIVED FOR THE DIAGNOSIS OF PARATYPHOID FEVER.

	Positive	Negative	Diagnosis Reserv.	Specimens Unsuitable for Exam.	Total
1917-1918—					
A	2				2
B		1			1
Total	2	1			3

IV. TUBERCULOSIS.

Examinations for tuberculosis consist principally of examinations for tubercle bacilli in sputum. During the biennial period 6,061 specimens of sputum were examined of which 1,064 were positive. During this period 27 specimens of feces and urine were also submitted for examination. Of these, four were positive as determined both by microscopic examination and animal inoculation. Ten specimens of milk were examined. Of these one was positive.

The laboratory does not encourage the sending of specimens of milk to determine whether or not an animal is effected by tuberculosis. The results are so often negative even when the animal is affected that the report is often misleading. It is very much more satisfactory to have an animal given the tuberculin test by a veterinarian than to examine specimens of milk.

Tubercle bacilli were found five times in thirty-two specimens of pus examinations, and once in seven specimens of cerebrospinal fluid examination. Evidence of tuberculosis was found in 103 specimens of tissue examinations. Animal inoculations were made in connection with certain specimens in which tuberculosis was suspected, but tubercle bacilli could not be found microscopically or for the purpose of determining whether or not certain acid fast bacilli found in feces and milk were tubercle bacilli. A more detailed account of the examinations is to be found in Table 4.

TABLE 4. SPECIMENS RECEIVED FOR THE DIAGNOSIS OF TUBERCULOSIS.

	Positive	Negative	Diagnosis Reserv.	Specimens Unfit for Examin.	Total
Sputum—					
1916-1917	559	2,595	45	11	3,210
1917-1918	505	2,317	12	17	2,851
Total	1,064	4,912	57	28	6,061
Feces and Urine—					
1916-1917	3	14	0	0	17
1917-1918	1	9	0	0	10
Total	4	23	0	0	27
Milk—					
1916-1917	0	2	0	0	2
1917-1918	1	7	0	0	8
Total	1	9	0	0	10
Pus—					
1916-1917	4	12	0	1	17
1917-1918	1	14	0	0	15
Total	5	26	0	1	32
Spinal Fluid—					
1916-1917	1	2	0	0	3
1917-1918	0	4	0	0	4
Total	1	6	0	0	7
Tissue—					
1916-1917	48	23	0	0	71
1917-1918	55	18	0	0	73
Total	103	51	0	0	144
Animal Inoculation—					
1916-1917	8	27	0	0	35
1917-1918	17	39	0	0	56
Total	25	66	0	0	91

Grand total: 1916-1917, 3,355; 1917-1918, 2,017, 6,372.

V. RABIES.

Rabies has not been as prevalent in Iowa during the past biennial period as during the several preceding ones. The number of examinations has accordingly been somewhat less. Evidence of rabies was, however, found in 35 instances. In 9 instances this evidence was furnished by the history of the case and in 26, by the finding of Negri bodies in the brains of the animals examined. Table No. 5 presents the laboratory findings in connection with the diagnosis of rabies.

TABLE 5. DIAGNOSIS IN CASES OF RABIES.

Year	Positive by			Negative	Diagnosis Reserved	Specimens Unsuitable for Exam.	Total
	Negri bod.	Inoc.	History				
1916-1917	14	0	3	30	6	3	57
1917-1918	11	0	6	13	0	3	33
Total	26	0	9	43	6	6	90

Of the 26 animals found to be affected by rabies, 21 were dogs, 2 skunks, 2 horses, 1 cow and 1 cat. Table No. 6 gives the data in connection with the animals examined for rabies. Results of the administration of the Pasteur treatment for the prevention of rabies is discussed under "Work of the Division of Immunization."

TABLE 6. KIND OF ANIMALS EXAMINED FOR DIAGNOSIS OF RABIES.

Year	Positive by			Negative	Diagnosis Reserved	Specimen Unsuitable for Exam.	Total
	Negri bod.	Inoc.	History				
Dogs	21	0	8	39	6	6	80
Cats	0	0	1	1	0	0	2
Cattle	1	0	0	2	0	0	3
Horses	2	0	0	1	0	0	3
Skunks	2	0	0	0	0	0	2
Total	26	0	9	43	6	6	90

VI. MENINGOCOCCIC MENINGITIS.

During the biennial period 19 specimens of cerebrospinal fluid were examined for meningococci. The organism was found in 8 of the cases. During this period 466 examinations were made of throat cultures from suspected meningococcic carriers. Two carriers were found. The examination of carriers is of great importance in finding the source of outbreaks or epidemics of this disease. Such examinations should be made early in the history of the outbreak. Table 7 presents the laboratory data in connection with the work on meningococci.

TABLE 7. SPECIMENS RECEIVED FOR DIAGNOSIS OF MENINGOCOCCIC MENINGITIS.

	Positive	Negative	Diagnosis Reserv.	Specimens Unsuitable for Exam.	Total
Spinal Fluid—					
1916-1917	4	3	0	0	7
1917-1918	4	6	2	0	12
Total	8	9	2	0	19
Cultures—					
1916-1917	2	464			466
Grand total					485

VII. GONORRHEA.

Diagnosis of gonorrhea is based on the detection of gonococci in smears. The organisms were found 69 times out of 198 examinations. In several instances cultures of the organisms were also made. The laboratory data in connection with the finding of gonococci is presented in Table 8.

TABLE 8. SPECIMENS RECEIVED FOR THE DIAGNOSIS OF GONORRHEA.

Smears	Positive	Negative	Diagnosis Reserv.	Specimens Unsuitable for Exam.	Total
1916-1917	26	68	6	0	100
1917-1918	43	45	10	0	98
Total	69	113	16	0	198

VIII. MISCELLANEOUS SPECIMENS.

A number of examinations were made of diseases which are either rare or of which but few specimens were submitted for examination. These include such diseases as malaria, amebic dysentery, anthrax, glanders, etc. The number of such examinations is represented by Table 10.

TABLE 10. MISCELLANEOUS SPECIMENS RECEIVED FOR EXAMINATION.

1916-1917	57
1917-1918	193
Total	250

IX. BRANCH LABORATORIES.

The number of examinations of the several types made in the branch laboratories is in Table 11.

TABLE 11. EXAMINATIONS MADE AT THE BRANCH LABORATORIES.

Locality	Diptheria		Typhoid		Tuberculosis		Miscellaneous		Total	
	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18	1916-17	1917-18
Ames	6	13	6	0	5	2	2	4	19	19
Burlington	142	17	2	13	0	3	0	0	144	32
Cedar Rapids	95	127	129	107	136	139	1,008	908	1,392	1,321
Clinton	9	0	3	0	7	0	0	0	19	0
Davenport	22	0	25	0	15	0	0	0	62	0
Des Moines	621	1,775	0	0	0	0	0	10	671	1,785
Little Rock	371	42	1	0	7	7	4	16	393	65
Mason City	300	149	0	28	96	63	2,224	2,326	2,572	2,565
Oskaloosa	7	0	25	1	38	0	136	17	198	18
Sioux City	89	71	12	4	27	42	2	1	131	118
Waterloo	98	46	44	32	155	75	0	0	297	153
Total	1,705	2,239	246	185	473	320	3,395	3,322	5,916	6,076
Combined total		3,944		431		793		6,724		11,992

X. PREPARATION AND DISTRIBUTION OF OUTFITS.

The laboratory sends out, daily, a large number of outfits for the collection of specimens for the diagnosis of diphtheria, typhoid fever and tuberculosis. These outfits are sent to various stations represented for the most part by drug stores. Practically every city in the state has one of these stations and a few of the larger cities have several. The cost of material for the making up of outfits has been very markedly increased during the past two years. Some of the articles have trebled in cost and practically everything else at least doubled. During the biennial period 38,306 outfits were distributed. Of these 26,766 were for diphtheria, 2,452 for typhoid and 9,806 for tuberculosis. The outfits distributed each year is shown in Table No. 12.

TABLE 12. OUTFITS DISTRIBUTED.

	Diptheria	Typhoid (Widal)	Tuberculosis	Total
1916-1917	12,050	1,570	4,650	18,270
1917-1918	14,716	884	4,436	20,036
Total	26,766	2,454	9,086	38,306

WORK OF THE DIVISION OF IMMUNIZATION.

The chief work of this division has been the administration of the Pasteur treatment for the prevention of rabies. During the biennial period 43 persons received the antirabic treatment. Each course of treatment consists of 25 separate treatments, making a total of 1,075 treatments—antirabic injections administered. Antityphoid vaccination was also administered to a number of persons in the laboratory. The antityphoid and antismallpox vaccinations were administered to a large number of students in the university before entering army service. In all 397 persons received the vaccination for the prevention of typhoid fever. Since each course consists of 3 injections, 1,191 antityphoid injections were administered. 405 persons were vaccinated for the prevention of smallpox. Table 13 presents in tabulated form the number and kind of vaccinations administered each month during the last biennial period. Of the 43 patients who received the Pasteur treatment, 38 were bitten by dogs, 1 by a cow, 2 by horses and 2 by skunks.

TABLE 13. PERSONS RECEIVING IMMUNIZING TREATMENT DURING 1916-17-1917-18.

1916	Antirabic	Antityphoid	Antismallpox	
July	1	0	0	
August	6	0	0	
September	0	0	0	
October	0	0	0	
November	0	0	0	
December	0	80	16	
1917				
January	0	0	0	
February	0	0	0	
March	3	0	0	
April	2	6	0	
May	0	70	60	
June	0	0	0	
	(x25=300)	165 (x3=495)	76	Total 871
1917				
July	0	0	0	
August	2	0	0	
September	0	0	0	
October	0	0	0	
November	0	0	0	
December	0	25	5	
1918				
January	0	105	0	
February	0	35	35	
March	1	8	280	
April	9	7	6	
May	14	49	3	
June	5	3	0	
	31 (x25=775)	232 (x3=696)	329	Total 1,800
Total	43 1,075	397 1,191	405	

Grand total 2,671

WORK OF THE WATER ANALYSIS DIVISION.

IN CHARGE OF JACK J. HINMAN, JR.

The Water Laboratory Division of the Laboratories for the State Board of Health is located at the State University of Iowa City, and like the other divisions of the laboratories is under the direction of Dr. Henry Albert. The work is directly in charge of Mr. Jack J. Hinman, Jr., water bacteriologist and chemist, who has been in charge of this work since the water laboratory was first opened in 1914. Mr. Cecil E. Ewen and Mr. Lamberto Daing have acted as laboratory assistants during the biennium. Mr. W. Gharrett Jordan, who had been junior water bacteriologist and chemist since July, 1915, resigned in September, 1916.

The Water Laboratory was opened in February, 1914, in accordance with an act of the 35th General Assembly which provided for an "epidemiologist and laboratory." The 36th General Assembly reorganized

the laboratory making it a part of the Laboratories for the State Board of Health. Prior to the reorganization the examination of water was made gratuitously, but since May, 1915, a fee has been charged as directed by law. The act of the 36th Assembly ordered that a fee, not to exceed two dollars should be charged and the amount was placed at one dollar per sample, except in certain special cases.

The number of samples examined up to the reorganization, July 1, 1915, was 1,366; during the year ending July 1, 1916, the number was 1,221; for the year ending July 1, 1917, it was 2,012, and for the year ending July 1, 1918, it was 1,955.

The equipment of the Water Laboratory is housed in a single room, but it is compact in design, and capable of handling a relatively large amount of work. With a comparatively small amount of additional assistance, the number of samples examined could be doubled.

Relatively few of the cities and towns have taken full advantage of the services offered by the laboratory, although it is only fair to say that the use of the laboratory is becoming more general as the work becomes better known.

There are a few towns such as Des Moines, Council Bluffs, Davenport, and Cedar Rapids where careful daily examinations are made of the water supplied to the citizens. Many plants are, however, too small to provide laboratories or the local conditions do not permit of these frequent tests. For these plants the Water Laboratory offers an opportunity to have the water supplies examined as often as may be desired. Too few plants take advantage of the opportunity, however. Some, like Burlington, have examinations made every week or so, but most plants send water samples very irregularly. Some have never sent any samples to the laboratory.

The number of examinations which are needed by any water works plant will depend, of course, upon the special local conditions. For example, a deep well supply ought to be examined at least every six months, and a shallow well supply at least every quarter. When the water level is unusually high or unusually low or when an unusually large pumpage is necessary there is likely to be a variation from the normal in the quality of the water. Many wells are imperfectly cased, or the casing does not go deep enough. Casings rust through in time. In some wells the casings rust through and develop holes sooner than in others. If the well is improperly cased or rusted through, surface water may get into the well and carry with it disease-producing bacteria. Examinations can show when something of the sort has happened and an inspection of the well may then disclose where the trouble lies. The reputation of a well for furnishing good water does not insure the quality of the water for all time.

Where water must be filtered or treated in some way to keep it safe for drinking purposes, the examinations should be made more frequently than where a well supply is in use. If the untreated water is from a source known to be unsafe, as from a river or unprotected pond or lake, the examinations should be made at least once a month. In times when the water is rapidly changing in quality, as in the early spring, it is necessary to know that the changes in the treatment are keeping pace with the quality of the raw or untreated water. In the colder weather most chemical processes work less satisfactorily than in the warmer weather and a closer watch is often necessary to see that they are operating sufficiently well to ensure a safe water. It is not enough that the water appears clear. It must also be safe from a bacteriological standpoint.

The laboratory can also be of service to the owners of private wells and to the persons who use the water from hotel or restaurant wells and the public wells of rural communities. It is known that water from such sources may be badly contaminated and dangerous and that the wells or springs may serve as foci for severe epidemics of typhoid fever and other intestinal diseases.

The work of the laboratory is chiefly preventive. It can point out the dangerous character of a water so that proper steps may be taken to exclude contamination or remove the contaminating influences. However, when an epidemic actually is at hand, the reports on the water supplies are of great assistance to the epidemiologists in detecting whether or not the disease is waterborne and, if so, the probable sources of the infection. Therefore while the service of the laboratory is chiefly preventive, it may also be remedial.

The act of the General Assembly which regulates the Water Laboratory stipulates that all investigations shall be "in the interest of the public health and for the purpose of preventing epidemics of disease." Samples of water submitted for mineral analysis in order to determine the suitability for boiler purposes or the supposed value as a mineral water are therefore rejected. The examination made is known as a "sanitary chemical and bacteriological examination." Just what this sort of an examination is, will be explained fully below. It is hoped, however, that funds may ultimately be available so that mineral examinations of public and institutional supplies may be made in the interest of boiler economy.

Sewage and its disposal are very closely related to public health problems, for sewage may contain, and probably usually does contain, the specific organisms of typhoid fever and other diseases. The dangers of infection to men and animals by some organism contained in sewage are often great, when the proper disposition of the sewage is not secured. Moreover the sewage may be a nuisance. Samples of sewage plant effluents are examined when desired in order that some notion may be had as to the degree of purification effected by the apparatus.

METHODS OF SENDING WATER SAMPLES.

In collecting samples of water for examination it is very important to make the collection in such a way as to avoid contamination. The properly collected sample must then be kept at a low temperature and delivered to the laboratory within the shortest possible time.

The laboratory outfit consist of one quart, wide-mouth, glass stoppered bottles which are protected by enclosure in galvanized iron cans and packed in metal-lined, insulated wooden boxes. When the outfits leave the laboratory they are packed with excelsior, but when they are to be returned, most of this excelsior is removed, the box is packed with broken ice, and only the small amount of excelsior necessary to steady

the can when the ice melts, is replaced. The cans are of such size that they do not fall over in the cases.

The bottles are cleaned with a strong chromic acid cleaning solution, rinsed, drained and sterilized by heat. The temperature is kept above 175°C. for at least an hour and a half. The tops of the bottles are then covered by a piece of sterile aluminum foil which is protected by a piece of muslin tied over it. The ends of the string are carried up over the stopper and held in place by an official wax seal. This seal, if unbroken, testifies to the sterile condition of the vessel.

Full directions for the collection of the sample of water are printed on the data blank sent out with the container. The recommended procedure is as follows:

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.

2nd. 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 the 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.

3rd. 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.

It is desirable at all times to have the water samples collected by a person who understands aseptic methods. An ignorant or careless person may easily introduce foreign matter or bacteria in amount sufficient to ruin the accuracy of the test.

The packing of the bottle in ice after collection is done because a low temperature retards chemical changes and restrains the multiplication of bacteria. It does not entirely prevent these changes, however, and in order that the sample may represent the actual condition of the water as nearly as possible, it is necessary that the sample be delivered at the laboratory within the minimum delay. To prevent the sample lying in an express office or at a way point over Sunday, it is requested that containers be started on their return journey not later in the week than Wednesday. When the sample reaches the laboratory the examination is begun promptly.

The containers used are rather large and expensive. It is not possible to allow them to be stocked in the stations in the various communities as is possible in the case of the outfits for examinations of sputum for tuberculosis, blood for typhoid fever and so on. The water containers are forwarded by express collect as soon as possible after the request for them is received. It is desired that those who request containers return them within about two weeks as otherwise some urgent requests may have to remain unfilled.

The laboratory does not make examinations of samples of water which are sent in in bottles and jugs unless there is reason to believe that the vessels have been properly prepared by a sterilization identical with that employed by the laboratory itself. Boiling is not a satisfactory substitute for the baking of bottles and stoppers at the high temperature employed (over 175°C.)

Cork, rolled paper and corn-cob stoppers are unsuitable because they usually yield extractive matters to the water as well as cause bacterial contamination. Jugs are often glazed with salt, which is part dissolved by the water. Jugs are also hard to clean properly. Dirt and foreign matters in the bottles or jugs used are obviously objectionable.

At one time a record was kept of the condition of forty-four samples of water submitted in these irregular containers. Out of the forty-four samples thirty-five were condemned, six were suspicious and only three were found to be uncontaminated. The policy of the laboratory has therefore been to reject all samples which have not been collected in accordance with the special directions in properly sterilized containers. It is desired not to waste the money which must be expended for the analysis and it is especially desired to give correct information regarding each sample. Contaminated samples may lead to the condemnation of supplies which are really satisfactory and this may involve a great waste of money in making unnecessary changes in the source and plant.

The Examinations:

As has been noted above, mineral or boiler analyses are not made by the Water Laboratory. The work is confined to sanitary examinations. These examinations involve chemical, physical and bacteriological determinations and their purpose is to show whether the water has been receiving contamination, particularly by sewage-like material.

Sewage, especially that from the sewers of towns and cities, is very likely to contain constantly the specific organisms of typhoid fever and similar diseases. It is estimated that from one-tenth to three-tenths per cent of our population are typhoid "carriers", or persons who continue to excrete the typhoid organisms, even though they show no clinical

symptoms at the time. Some of these carriers are known to have been excreting dangerous bacteria nearly fifty years after they had the disease.

City sewage is usually diluted with a large volume of flush water so that the chemical changes in the water of the stream into which it flows may actually be less than that brought about in a well which is polluted from a neighboring privy vault. It is conceivable, too, that a sewage-polluted well might be used for a time without apparent ill results, because typhoid or other pathogenic organisms were not deposited in the near-by vault by the inhabitants. If they or some visitor should deposit dangerous organisms in the vault these could then gain access to the well which might then become the focus of an epidemic. Such cases are on record.

Any well or untreated water supply, therefore, which shows evidence of sewage contamination should be considered dangerous.

From the analyst's standpoint the contamination is shown by large numbers of bacteria, by the presence of typical sewage bacteria of a type commonly more numerous and hardy than the typhoid bacterium, itself, by the increased amount of common salt, by the amount and the condition of the combined nitrogen, and sometimes by the odor or physical appearance of the water. Due to local conditions the information derived from some of these determinations may be of highly variable importance. For instance, an increase in the amount of salt may be due to local salt deposits laid down ages ago. Some geological formations contain the remains of organic matter which may affect the nitrogen determinations, while some rocks are so soluble that water has dissolved channels through them which may allow polluted water to penetrate to great depths. The more the analyst knows about the local conditions the better. It is not always practical for him to make a survey of the source of the water supply personally and for that reason it is necessary to depend on the sender of the sample to furnish the necessary data as to the conditions and history of the supply.

The determinations actually made in the laboratory are as follows:

(1) Number of bacteria per cubic centimeter on neutral litmus lactose agar after 24 hours incubation at 37°C.

(2) Number of bacteria per cubic centimeter on plain nutrient agar, 1% acid, after 48 hours' incubation at 20°C.

(3) Number of acid colonies per cubic centimeter on litmus lactose agar after 24 hours' incubation at 37°C.

(4) Gas forming bacteria in lactose broth after 24 and 48 hours' incubation at 37°C.

(5) Physical examination—odor.

(6) Physical examination—color.

(7) Physical examination—turbidity.

(8) Physical examination—sediment and larger microscopic organisms.

(9) Chemical determination of nitrogen as free ammonia (in parts per million.)

(10) Determination of nitrogen as albuminoid ammonia.

(11) Determination of nitrogen as nitrites.

(12) Determination of nitrogen as nitrates.

(13) Determination of chlorine.

The bacterial examinations are reported in numbers or presence or absence is noted in a specified volume of the water. The physical determinations are not ordinarily reported numerically. The chemical determinations are all reported in parts of the substance present in one million parts of water by weight, usually abbreviated "to parts per million", or "p. p. m."

Some other determinations are occasionally made. These are usually determinations of iron, alkalinity, total solids, and in the case of sewage, determinations of stability, oxygen consumed, etc. Sometimes more elaborate confirmatory tests for the identification of the colon bacillus are applied, but usually the development of gas in lactose broth in 48 hours and the production of acid on litmus lactose agar is considered sufficient presumptive evidence. When small samples are examined the ammonia determinations are sometimes omitted since they require a rather large amount of water.

Upon the completion of the analysis a statement of the analytical findings together with an explanatory letter is sent to the person who sent in the water sample. A duplicate copy of the analytical findings is sent to the mayor of the city or town as the president of the local board of health.

An effort is made at all times to explain clearly just what the examination shows and to suggest possible remedies. It is realized that it is often unwise to be guided entirely by a single analysis, especially in the case of new wells and treated supplies, and therefore when there seems to be doubt as to the quality of the water or its future improvement, we request additional samples. It would be easier in many cases (though less correct) to explain the condition of the water to the satisfaction of the average person, by means of fixed numerical standards. It would, however, be necessary to cite so many exceptions that the standard would in the end make matters more confusing. The correct interpretation of results, even when all available data are at hand, is a matter requiring a considerable amount of skill, experience and knowledge of general conditions.

SPECIAL INVESTIGATIONS.

Most of the work which is done by the water laboratory force is of necessity confined to the laboratory itself. Occasionally questions arise which require the presence of some member of the staff in some other community. During the biennium Mr. Hinman has made official trips to Camp Dodge, Grinnell and Dubuque and Mr. Ewen was sent to Mason City in connection with some sewage work. Brief mention of these investigations is set forth below.

Mason City

At the request of Dr. A. L. Wheeler, health officer, Mr. Ewen went to Mason City to collect samples of sewage and conduct some determinations on the amount of oxygen dissolved therein. The material under consideration was the highly concentrated waste of a packing house.

Camp Dodge

At the request of Major Milford A. Butler, constructing quartermaster, Mr. Hinman made two trips to the site of the proposed cantonment on June 27, 1917, and July 10, 1917. A survey of the wells was made and

samples were collected for examination. The bacterial counts in the water from the newly driven wells were naturally high when the samples were first collected. The later samples showed much smaller numbers of bacteria, but were not entirely satisfactory as they contained acid- and gas-forming bacteria. Samples taken August 17, 1917, by Major E. E. Craft U. S. M. C., confirmed the opinion rendered. It was recommended that the water be treated with liquid chlorine in order to render the water entirely safe. The necessary machines were promptly installed.

Grinnell

On the day following his first visit to Camp Dodge (June 28, 1917), Mr. Hinman went to Grinnell to inspect the sewage disposal plant and instruct the operator in the proper collection of samples which were desired by the council in order to have a record of the operation of the plant. It was decided to send two samples in each set of samples. One sample was to be taken from the plant effluent and the other from the stream into which it discharged. The sample from the stream was to be taken about 200 feet above the outlet from the sewage plant. A few other samples have also been taken at other points. Forty-one analyses has been made in this series.

Dubuque

At the request of Honorable James Saul, Mayor of Dubuque, Mr. Hinman went to Dubuque on March 14, 1918, to investigate the condition of the water supply in connection with an epidemic of typhoid fever which was then endangering the citizens. A careful survey of the system was made and eleven field oacterial examinations of water from various parts of the city were carried out. In addition six samples of water were sent to Iowa City for more complete examination. A canvass of the typhoid cases was also made to determine the sources of water used by the persons affected. This work occupied four days. Mr. Hinman left Dubuque on the morning of the nineteenth. Dr. John H. Hamilton, epidemiologist of the State Board of Health, arrived in Dubuque on March 18th and conducted the epidemiological investigations. After completing the analyses of the samples of water Mr. Hinman prepared the following statement of his investigation for Mayor Saul:

March 25, 1918.

Hon. James Saul, Mayor, Dubuque, Iowa.

Dear Sir: On March 14th, pursuant to a request from your office, submitted through the office of Dr. G. H. Sumner, Secretary-Executive Officer of the State Board of Health, I went to Dubuque to investigate the condition of the city water works system and its connection with the epidemic of typhoid fever. I remained in the city until the morning of March 19th. During the time I was in the city I made an inspection of the plant and a canvass of the cases of typhoid fever to learn the source of drinking water used. I collected a number of samples of water, some of which I examined in Dubuque and others of which I sent to Iowa City for more complete examination.

The water system of Dubuque is rather complicated, especially as to the source of water supplied. The water is derived from a tunnel known as "The Level," from a number of six-inch driven wells said to be from sixty to one hundred feet deep, one well eight feet in diameter and one hundred feet deep and two artesian wells over 1,250 feet in depth. All of these wells are located at Eagle Point. There is in addition another artesian well about 1,300 feet deep located on 5th street. There are also two six inch suction lines running to the Mississippi river at a point some four

hundred feet off shore. There are three reservoirs and a stand pipe in use. One of the reservoirs located at "The Level" is nearly fifty years old, but is in apparently good condition. Another is located at Eagle Point, while a third is located on the hills. There is also a stand pipe which supplies the hill district and furnishes the pressure for the down town high pressure system. All of these units are connected, but the water which is used in the stand pipe and the high pressure system is pumped from the "Level Reservoir" and contains under ordinary conditions a rather large proportion of water from the tunnel. The deficit is made up from water pumped from Eagle Point. The new 7,500,000 gallon reservoir is used to float on the low pressure system, any excess pumpage going into the reservoir when it is in use and any unusual demands being met by the water stored there.

My examination of the water supplies showed that the water from both of the artesian wells located at Eagle Point was satisfactory. A recent analysis had shown that the water from the 8-foot well was in good condition. The water from "The Level," while in satisfactory condition is not so satisfactory bacterially as the water from the artesian and 8-foot wells. The condition of the water from the artesian well at 5th street is not yet satisfactory, due probably to the disturbance caused by working with it. It has been recently shot with dynamite. The water from the driven wells, however, has been shown by four separate examinations to be unsatisfactory in quality. The objection to the water from the driven wells is found in the large number of bacteria present and the presence of bacteria of sewage-like origin. The water of the river can at no time be considered safe for use in its untreated condition. The detailed reports of the examinations are appended to this letter.

An inquiry as to the source of water supply used by the twenty-two reported cases of typhoid fever showed that most of these were supplied from the low pressure system, while two did not have the city water in their homes. I learned, however, that these two cases had been in the habit of drinking the city water at the places where they were employed. I examined the water from the wells which they used at home and found them in satisfactory bacterial condition. One other private well was examined, but it had not been used until after the outbreak. This well (20 Kline street) did not appear to be satisfactory on the basis of the bacterial count. Except for these three wells there were no other wells in use among the families of the persons suffering from the disease. There were a few cisterns, but in every case the water had not been used for drinking before the outbreak of the epidemic.

It would therefore seem on the basis of this investigation, that so far as the water supply is concerned the city water is the only source which can be suspected.

I learned from the water works men that during the two months preceding February 1st, more or less untreated river water had been pumped into the city mains without any treatment whatsoever. This was most dangerous and in my opinion was the cause of the very serious contamination of your water supply. As to its connection with your epidemic I will refer you to the report of Dr. J. H. Hamilton, of the State Board of Health.

My recommendations on the basis of my examination and inspection are these:

1. That no river water be pumped at any time without preliminary filtration or other sufficient treatment and that in case of an emergency and consequent necessity to use the river water, the public be notified immediately by means of posters and newspaper notices and that they be warned to boil the water until bacterial examinations of water from the dead ends of the mains show that all contamination is removed. With regard to the purification of the river water I would warn you that chlorination of the turbid water, especially in winter time, is not considered satisfactory on the basis of experience in other localities. The valves on

the pipes leading to the river might well be sealed with a lead seal in such a manner that although the valve could be readily opened in a case of emergency, the breaking of the lead seal would testify to that fact.

2. That the water of the driven wells be not used in its present untreated condition, but that it be treated with calcium hypochlorite or preferably by liquid chlorine in an approved manner before being pumped into the system.

3. That examinations be made of the water from the other sources at frequent intervals, keeping particular watch on the water of "The Level" since its variation in composition under different conditions is not well known.

4. That the above mentioned examinations be made by some competent local person and that they be supplemented by occasional more complete examinations made by the state laboratories.

5. That in order to avoid difficulties with odors and tastes arising from the growth of algae in the large reservoir, this reservoir be provided with a cover so that light may be excluded and the growth of algae be restrained.

Respectfully submitted,
JACK HINMAN, JR.,
Water Bacteriologist and Chemist.

Approved, HENRY ALBERT, Director.

OTHER INVESTIGATIONS.

Oakdale.

The investigations of the operation of the Oakdale Sanitorium sewage disposal plant, which was detailed in the last biennial report was continued until October 17, 1916. Twenty-three samples were analyzed. A new series of examinations was begun September 19, 1917, and continued until April 3, 1918. In this series there were 75 samples. The operation of the plant was not uniform in its efficiency.

Burlington.

The Citizens Water Company of Burlington has continued to have its effluent examined at frequent intervals at the laboratory. During the biennium the number of samples submitted was 188. Other plants which treat a variable water would do well to follow Burlington's example in this matter.

State University.

The laboratory keeps a close watch over the two swimming pools belonging to the University. Daily examinations are made during the time the pools remain open for use.

By a special arrangement with the University and the Iowa City Water Company daily inspections are also made of the water supplied to the students and to the citizens. It has been possible to keep the water in satisfactory condition most of the time as a result of this rigid supervision and at the infrequent intervals when it was found that the water was not entirely safe, the people have been notified.

The Emergency Chlorinator.

An emergency chlorinator for the administration of liquid chlorine has been lent to the State Board of Health by the Wallace and Tiernan Company of New York. This apparatus is at the call of any municipality which is suffering from or threatened by an epidemic of water-borne disease. It has been in use on but one occasion, however. In March, 1917, there was contamination of the wells at Cedar Falls due to high water, an epidemic of diarrhea resulted and the chlorinator was installed to destroy any pathogenic organisms which the water might contain.

Extent of the Use of the Laboratory.

The following table shows the cities and towns from which samples were received from public sources. Those communities which are not listed have presumably failed to take advantage of the opportunity offered by the laboratory to learn the actual state of the water supplied to their citizens. It is possible, of course, that some of the twenty-four samples, which were not accompanied by data as to their ownership, may have come from other public supplies.

CITIES AND TOWNS FROM WHICH PUBLIC SAMPLES WERE RECEIVED BIENNIUM 1916-1918.

Adair County—Greenfield, Mechanicsville, Fontanelle.
Adams County—Corning.
Allamakee County—Waukon.
Appanoose County—Centerville.
Audubon County—Audubon.
Benton County—Belle Plaine, Blairstown, Keystone, Mt. Auburn, Norway, Urbana, Vinton.
Black Hawk County—Cedar Falls, La Porte City, Waterloo.
Boone County—Boone, Madrid.
Bremer County—Sumner, Waverly.
Buchanan County—Jesup, Quasqueton.
Buena Vista County—Albert City, Storm Lake, Truesdale.
Butler County—Green, Shell Rock.
Calhoun County—Jolley, Lake City, Lake Mills.
Carroll County—Carroll, Manning, Templeton.
Cass County—Atlantic.
Cedar County—Durant, Lowden, Tipton, West Branch.
Cerro Gordo County—Mason City, Rockwell, Thornton.
Cherokee County—Cherokee, Marcus.
Clay County—Rossie, Spencer, Webb.
Clayton County—North McGregor.
Clinton County—Clinton, De Witt, Lost Nation.
Crawford County—Denison, Kiron, Vail.
Decatur County—Davis City.
Delaware County—Manchester, Robinson.
Des Moines County—Burlington.
Dickinson County—Milford.
Dubuque County—Dubuque, Dyersville.
Fayette County—Fayette, Maynard, Oelwein, West Gate, West Union.
Floyd County—Charles City, Rockford.
Franklin County—Alexander.
Fremont County—Hamburg.
Greene County—Jefferson.
Grundy County—Panora.
Hamilton County—Jewell, Kamrar, Webster City, Williams.
Hancock County—Corwith, Kanawha.
Hardin County—Alden.
Harrison County—Logan, Missouri Valley.
Henry County—Mt. Pleasant, Mt. Union, Olds.
Howard County—Lime Springs.
Humboldt County—Dakotah City, Humboldt, Renwick.
Ida County—Galva.
Jackson County—Bellevue, Green Island, Maquoketa, Miles.
Jasper County—Baxter, Kellogg, Monroe, Newton.
Jefferson County—Batavia, Fairfield.
Johnson County—Iowa City, Lone Tree, Oakdale, Oxford, Solon.
Jones County—Center Junction, Wyoming.
Kossuth County—Germania, Swea City.

Lee County—Fort Madison, Keokuk, West Point.
Linn—Kenwood Park, Marion, Mt. Vernon.
Louisa County—Wapello.
Lucas County—Chariton.
Lyon County—George, Little Rock, Rock Rapids.
Madison County—Earlham, Winterset.
Mahaska County—Knoxville.
Marion County—Pella, Pleasantville.
Marshall County—Bangor, Ferguson, Marshalltown, Van Cleve.
Mills County—Glenwood.
Mitchell County—Little Cedar, New Haven, Osage.
Monroe County—Lovilia, Rexfield.
Muscatine County—Muscatine.
O'Brien County—Paullina, Sanborn, Sheldon, Sutherland.
Osceola County—Harris, Ocheyedan, Sibley.
Page County—Braddyville, Clarinda, Coin, Shenandoah.
Palo Alto County—Graettinger.
Plymouth—Kingsley, Westfield.
Pocahontas—Laurens, Palmer.
Polk County—Bondurant, Camp Dodge, Carney, Mitchellville, Valley Junction.
Pottawattamie County—Council Bluffs, Oakland.
Poweshiek County—Grinnell.
Sac County—Sac City.
Scott County—Davenport, Le Claire.
Shelby County—Shelby.
Sioux County—Alton, Hawarden, Hospers, Rock Valley, Sioux Center.
Story County—Ames, Colo, Maxwell.
Tama County—Gladbrook, Tama, Toledo.
Taylor County—Bedford, Lenox.
Union County—Creston, Shannon City.
Van Buren County—Bonaparte.
Wapello County—Ottumwa.
Warren County—Indianola.
Washington County—Ainsworth, Riverside, Washington.
Wayne County—Corydon, Lineville.
Webster County—Fort Dodge.
Winnebago County—Thompson, Lake Mills.
Winneshiek County—Calmar, Decorah.
Woodbury County—Calmar, Sioux City.
Worth County—Manly.
Wright County—Belmond, Clarion, Eagle Grove, Goldfield.

COUNTIES FROM WHICH NO SAMPLES PUBLIC OR PRIVATE WERE RECEIVED.

Biennium 1916-1918.

Chickasaw County.
Davis County.
Emmett County.

SUMMARY WORK OF WATER LABORATORY FOR BIENNIUM 1916-1918.

Public	Good 1916-17	Good 1917-18	Good 1916-18	Bad 1916-17	Bad 1917-18	Bad 1916-18	Doubtful 1916-17	Doubtful 1917-18	Doubtful 1916-18	Total 1916-17	Total 1917-18	Total 1916-18
Shallow wells	49	34	89	41	51	92	20	20	46	116	100	[illegible]
Deep wells	94	65	139	17	16	33	19	19	38	130	100	[illegible]
Springs	2	1	4	0	1	1	3	0	3	6	2	[illegible]
Treated	489	316	985	22	12	44	24	14	38	535	542	1,067
Raw streams	6	9	6	363	402	765	9	1	10	378	[illegible]	[illegible]
Lakes, etc.	2	6	9	2	10	12	1	5	6	6	21	27
Ice	0	0	0	3	0	3	0	0	0	3	0	[illegible]
Cisterns	0	0	0	1	0	1	0	0	0	1	0	1
Miscellaneous	8	1	9	7	6	13	4	5	9	19	12	[illegible]
Sewage	0	0	0	42	100	143	0	0	0	42	100	[illegible]
Swimming pools	314	388	902	19	40	59	2	6	9	536	434	[illegible]
	1,146	1,011	2,157	528	638	1,166	80	70	150	1,765	1,719	[illegible]
Private—												
Shallow wells	52	40	92	92	112	204	24	28	52	168	180	[illegible]
Deep wells	17	19	36	10	7	17	12	4	16	29	30	69
Springs	0	0	0	1	3	4	0	0	0	1	3	4
Streams, etc.	0	0	0	0	4	4	0	1	1	0	5	5
Ice	11	5	16	5	0	5	0	0	0	16	5	21
Cisterns	0	1	1	6	4	10	0	0	0	6	5	11
Miscellaneous	0	0	0	3	2	5	0	0	0	3	2	5
	80	65	145	117	132	249	36	33	69	233	230	[illegible]
Ownership not Stated—												
Shallow wells	0	1	1	0	0	0	0	0	0	0	1	1
Deep wells	0	0	0	0	0	0	0	0	0	0	0	0
Springs	0	0	0	0	0	0	0	0	0	0	0	0
Streams	0	0	0	0	0	0	0	0	0	0	0	0
Ice	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Cisterns	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Miscellaneous	0	0	0	0	1	1	0	0	0	0	1	[illegible]
	0	1	1	0	1	1	0	0	0	0	2	[illegible]
No data	2	0	20	10	2	12	4	2	6	16	4	[illegible]
Total	1,228	1,077	2,305	605	763	1,418	120	106	234	2,012	1,955	[illegible]

Samples received from 96 counties.
Samples received from 346 cities and towns.
Samples received from public sources of 203 cities and towns.

THE EPIDEMIOLOGICAL LABORATORY.

The work of the epidemiological laboratory was started in 1915. Previous to this, several isolated epidemiological investigations had been made by different members of the laboratory staff. Since 1915 the work has gradually increased both in regard to the amount of work and the scope.

The epidemiological laboratory devotes its attention to the study of epidemics. Whenever a disease becomes unusually prevalent in a community the epidemiological laboratory endeavors to determine the cause of this prevalence of disease.

In order to determine the cause it is necessary to consider first, the source of infective material and second, the means by which it is conveyed from one person to another. In an effort to determine the means of conveyance, inquiry sheets have been devised which cover practically all possible means of infection. Each patient is questioned very carefully by the investigator and the answers recorded on the inquiry sheet. When a sufficient number of inquiry sheets have been filled out it is possible by tabulating this data to determine the means of conveyance by statistical methods. If then, we can get confirmatory data by laboratory examinations, it is quite possible to prove, beyond reasonable doubt, the cause of the epidemic.

The work of the epidemiological laboratory consists of both office and field work. A careful check is made of all laboratory examinations, morbidity reports and newspaper clippings and other information in order to learn of the prevalence of disease in any community. Whenever the laboratory learns that a disease is unusually prevalent in a community a letter is written to the health officer, mayor or some other official of the local board of health, suggesting measures which would tend to throw light upon the situation. Sometimes it is necessary to have the health officer or local physician fill out inquiry sheets, sometimes it is necessary to request that certain specimens be sent to the laboratory for examination and sometimes it is necessary for an entire school or institution to be examined carefully in order to detect the presence of carriers. Whenever possible the laboratory endeavors to carry on the work without a field investigation.

This part of the work is growing to a considerable volume and gives promise of being the most useful work of the laboratory. However, it is occasionally necessary for the epidemiologist to make a field investigation. It frequently saves time and is occasionally the only method by which the epidemiologist can get the necessary information.

When a community desires to secure the services of the epidemiologist for a field investigation they should send a request to the Secretary-Executive Officer of the State Board of Health, asking him to send the epidemiologist. They should also inform the Secretary of the State Board of Health the nature of the disease and the number of cases which have developed up to the time the request is presented.

Since there is no provision made by the state for the payment of the traveling expenses of the epidemiologist it is necessary for the local board of health to guarantee the traveling expenses of the epidemiologist. After the Secretary of the State Board of Health has been informed of the desires of the local board of health and has been informed of the local conditions he requests that the director of the laboratory send the epidemiologist to assist the local board in the study and control of the epidemic.

During the past biennium the following field epidemiological investigations were made:

No.	Date	Disease	County	Town or City	Manner of Infection	By Whom
1	7 & 8 -16	Diphtheria	Johnson	Oakdale	Contact	Mark F. Boyd
2	7-26, 29-16	Typhoid fever	Jasper	Kenton	Milk (bottles)	Mark F. Boyd
3	8- 1-16	Typhoid fever	Jasper	Baxter	Contact and flies.	Mark F. Boyd
4	8- 2, 4-16	Typhoid fever	Shiek	Manchester	Contact	Mark F. Boyd
5	8- 3, 4-16	Diphtheria	Dimmet	Ellsworth Township	Contact	Mark F. Boyd
6	11- 2, 4-16	Diphtheria	Tama	Montour	Contact	Mark F. Boyd
7	11- 4, 6-16	Scarlet fever	Delaware	Prairie Township	Contact	Mark F. Boyd
8	11-10, 12-16	Diphtheria	Lyon	Little Rock	Tonsil.	Mark F. Boyd
9	11-18, 24-16	Typhus fever	Lee	Fort Madison	Contact	Mark F. Boyd
10	11-26, 28-16	Diphtheria	Story	Nevada	Contact	Mark F. Boyd
11	2-20, 22-17 3- 21-17	Pneumococcus Meningitis (Diagnosis)	Floyd	Charles City		Mark F. Boyd
12	4-10, 11-17	Meningococcus Meningitis	Hardin	Eldora	Contact	Mark F. Boyd
13	4- 22-17	Diphtheria	Scott	Davenport	Contact	Mark F. Boyd
14	4- 13-17	Scarlet fever	Hancock	Garner	Contact	Mark F. Boyd
15	4- 22-17	German measles	Poweshiek	Brooklyn	Contact	Mark F. Boyd
16	4- 26-17	Typhoid fever	Jasper	Baxter	Contact?	C. Demaree
17	4- 8-17	Typhoid fever	Pike	Carney	Butter	
18	4- 7-17	Typhoid fever	Buchanan	Hazleton and Buffalo		Mark F. Boyd
19	4- 4, 6-17	Typhoid fever	Fayette	Scott Township	Butter?	Mark F. Boyd
20	4- 6-17	Typhoid fever	Fayette	Fremont Township	Contact	Mark F. Boyd
21	9-11, 13-17	Diphtheria	Marshall	Le Grande	Contact	Mark F. Boyd
22	9-24, 25-17	Typhoid fever	Mahaska	Oskaloosa	Contact?	Mark F. Boyd
23	9-27, 30-17	Typhoid fever	Buena Vista	Storm Lake City	Contact?, Water.	Mark F. Boyd
24	10- 2, 3-17	Typhoid fever	Clinton	Clinton	Flies	Mark F. Boyd
25	10- 14-17	Typhoid fever	Taylor	Mt. Vernon	Milk?	Mark F. Boyd
26	11- 6-17	Tuberculosis (diagnosis)	Taylor	New Market		Mark F. Boyd
27	11- 28-17	Diphtheria	Hamilton	Webster City	Contact	Mark F. Boyd
28	11- 7-18	Typhoid fever	Howard	Lime Springs	Contact	Mark F. Boyd
29	11- 19-18	Smallpox	Mitchell	Osage	Contact	C. B. McMurphy
30	2- 21-18	German measles	Scott	Davenport	Contact	J. H. Hamilton
31	3- 8-18	Scarlet fever	Polk	Des Moines	Contact	J. H. Hamilton
32	3-11, 15-18	Smallpox	Wayne	Corydon	Milk	J. H. Hamilton
33	3-18, 21-18	Typhoid fever	Dubuque	Dubuque	Water	J. H. Hamilton
34	4- 18-18	Scarlet fever	Humboldt	Livermore	Contact	J. H. Hamilton

Summaries of the reports of these field epidemiological investigations follow:

Diphtheria—Iowa Tuberculosis Sanitarium, Oakdale, Johnson County, Iowa. July and August, 1916. By Dr. Mark F. Boyd.

By order received from Dr. G. H. Sumner, Sec.-Exec. Officer of the Board, through Dr. Scarborough, Supt. of the Sanitarium.

Reason—To recognize and control diphtheria carriers among the patients and employees of the Sanitarium.

History—Since February of the present year there have occurred several very mild clinical cases of diphtheria. The earliest of these developed among employees and patients coming into close contact with employees. The early cases were confined to the sanitarium, but in the last two months the disease made its appearance in the hospital. In the meantime clinical cases had ceased to appear in the sanitarium but the disease seemed to resist all efforts at control in the hospital.

Epidemiologist advised the following policy, which was immediately put in effect.

(a) The detection and isolation of carriers, whether among the patients, employees or staff, until their continued freedom from diphtheria bacilli has been demonstrated, was the fundamental recommendation.

(b) It was decided to first institute the cultural search for carriers among the patients and employees of the hospital, since the recent situation centered about the hospital.

(c) Certain practical difficulties such as the necessity for the tactful handling of employees to secure co-operation, and in the provision of isolation quarters for the recognized carriers, were left to the Superintendent for solution.

(d) It was decided to repeat the culture taking from everyone connected with the sanitarium, as many times as necessary, until it seemed reasonable to conclude that all carriers had been recognized, as indicated by negative reports on all cultures taken at a single examination.

(e) Carriers recognized were to be detained in isolation until a minimum of three consecutive negative cultures had been obtained from the nose and throat.

(f) That the necessity for actively immunizing carriers with diphtheria antitoxin be judged from the character of the cutaneous reaction to diphtheria toxin (Schick test).

(g) That, following the control of the present situation, routine cultures shall be taken from the nose and throat of all persons admitted to the sanitarium; either as patients or employees, and that such practice be repeated upon the return of any patient or employee following an absence from the sanitarium of a week or longer, and, that until the report on the routine culture is available, such new arrivals shall be isolated.

(h) That the Laboratories for the State Board of Health would supply the necessary culture media, sterile swabs and examine the cultures secured, furnish the standardized toxin for the Schick test and that the epidemiologist would instruct the physicians of the sanitarium staff in

the most expeditious system of culture taking and also assist in this work.

In the course of this campaign a total of 1,933 cultures were taken from both the nose and throat of patients and employees, including both those for the detection of carriers and those for the release of former carriers. Of these 177 were positive, 43 were atypical and necessitated a reserved diagnosis, with repetition of the culturing, while 1,713 were negative. This work was carried on throughout July and August. As a result 56 carriers were detected, of whom 28 were from the hospital (one-half the patients) and 28 from the sanitarium. With some inconvenience isolation quarters were provided in the hospital and carriers detected in the sanitarium were transferred to the hospital for isolation. Carriers were isolated until from five to seven consecutive negative cultures were obtained.

Forty-eight of the hospital patients were tested intracutaneously with diphtheria antitoxin, to determine their susceptibility to diphtheria. The results were as follows:

RESULTS OF SCHICK TESTS.

	Positive Schick	Doubtful Schick	Negative Schick	Totals
Totals	12	6	30	48
Carriers	4	2	20	26
Non-carriers	8	4	10	22

From this it can be seen that most of the carriers were individuals who possessed a natural immunity against diphtheria toxin. Only a few carriers were found among persons susceptible to the disease. On the other hand, the virulence of the strain of infecting diphtheria bacilli has undoubtedly been low, as it indicated by the few mild clinical cases of diphtheria of the recent outbreak and the result of a virulence test performed with one strain of the organism. The age of the inmates of the hospital, the majority of whom were adults, is probably the factor responsible for the large number of immune persons, as indicated by the Schick test.

Present Condition—The situation now seems to be under control and the carriers at present isolated or rapidly being released. The past situation has shown the needs of suitable quarters for the isolation of patients. As an additional safeguard, it is recommended that routine cultures be taken from all patients and employees every two or three months, in order to guard against the introduction of infection by visitors.

INVESTIGATION NO. 2 SUMMARY.

SUPPLEMENTAL INVESTIGATION.

Continuance of investigation of Typhoid Fever in Newton, Jasper county, Iowa. By Dr. Mark F. Boyd, August 14-15, 1916.

By order from Dr. G. H. Sumner, Sec. Exec.-Officer State Board of Health.

Reason—To determine source of infection of cases of typhoid fever recognized since the first investigation.

Epidemiologist learns of eleven cases of typhoid fever recognized since July 28, 1916. Additional cases as follows:

No.	Age	Sex	Occupation	To Bed	Water	Milk
10	25	F	At home—clerk	July 24	City	X
11	25	M	Teamster	Aug. 5	City well	X
12	36	M	Business man	Aug. 5	City well	X
13	24	F	School teacher	July 24	City well	X
14	12	F	School girl	July 31	Well	X
15	50	F	Solicitor	July 26	City	X
16	40	M	Merchant	July 29	City	X
17	22	M	Taxi driver	Aug. 3	City	X
18	5	F	At home	July 31	Well and city	X
19	23	M	Iron maker	July 29	City	X
20	12	F	School girl	July 28	City	X

Cases 2, 8, 9, 19, 4, 16, and 12 were out of town preceding their illness, but it is clear the majority of cases contracted infection in Newton. Except No. 2 and 8 the onsets of the out-of-town cases co-incide with these who had not been outside, which indicates these out-of-town cases received infection in Newton. Case 2 was at Colfax before he took to bed, but several days after he first felt ill. Case 8 left Newton 7 days before she took sick and was sick while away from home. Case 2 felt ill sometime before case 8.

Most of the cases are in young adult males. The cases are confined to the central, north eastern and south western portions of the city. The majority (19) of the cases live in good sanitary surroundings.

No case gave a history of contact. 19 cases had used the city water and, 1 case used well water exclusively. All cases (20) had used milk furnished by Dairy X. 14 used milk as a beverage and 6 used it upon cereals. In no instance was it heated before use. 3 cases had not used ice cream, 4 were uncertain concerning its use, 2 used home made ice cream, while the remaining 11 had consumed retailed ice cream. Butter, meals, foods, flies and swimming in polluted water could be excluded.

Water was excluded as a route of infection for reasons given in the preceding summary.

It was found that of 10 cases where preceding health was poor, 6 were heavy users of milk, while of 7 whose health had been poor, only three were heavy milk drinkers. In 14 invaded households there lived 62 persons of whom 14 used X milk as a beverage. In these households there occurred 15 cases of typhoid, 11 of which were in persons who used X milk as a beverage.

Case 2 was on first part of X's A.M. route, being served previous to case 8 or any of the subsequent cases. Case 8 could only have been exposed to infection from case 2 through X milk preceding July 4. Case 18 used X milk subsequent to July 1. Cases 12 and 19 ceased use of X milk on July 10. The onsets of the cases, judging from dates they first felt ill, indicates infection was probably received between July 1st to 10th. A son of Dairyman X, living in Des Moines, visited at home in New-

ton on July 9th and 16th. On the 26th he developed typhoid fever in Des Moines. Denied use of milk at home. Seems probable was infected by indirect contact in Newton from driver on milk route or by some infected article in dairy.

Same conclusions reached as noted in preceding summary.

No addition to recommendations given in preceding summary.

Results—Mayor has urged council to require inspection of milk supplies but no action has as yet been taken. X is pasteurizing most of his milk by holding process at 150 degrees C, in bulk.

INVESTIGATION NO. 3 SUMMARY.

Continuation of investigation of Typhoid Fever in Newton, Jasper county, Iowa, by Dr. Mark F. Boyd, September 16-17, 1916.

By order from Dr. G. H. Sumner, Secretary-Executive Officer, State Board of Health, at request of Mr. E. P. Malmberg, Mayor.

History—About 20 additional cases of typhoid have been recognized since preceding investigation, a month before. For a period of nearly two weeks following the first of August no new cases were recognized, after which, during a period of about 3 weeks, 26 new cases of typhoid fever were reported. In the interval since the first investigation the local Board has not executed the recommendations therein made. As a result of the efforts of the Chairman of the Local Board, the State Dairy Commissioner on September 12, refused to permit Dairyman X to do business in Newton, by withholding license from him. This will doubtless be of value.

Epidemiologist learned of 26 new cases of typhoid recognized since August 15, 1916. In the table are presented all recognized cases of typhoid in Newton this summer, which have not been presented heretofore.

TABLE NO. 1.

No.	Age	Sex	Occupation	Contact	Water	Milk	Meals
21	21	M	§Student in D. M...	.....	Well	None	Various
23	8	F	School girl	No. 18	City and well..	Dairy X	At home
23	8	M	School boy	.....	Well	Dairy X	At home
24	24	F	At home	.....	City	Dairy X	At home
25	48	M	Drayman and clerk	.....	City	Dairy X	At home
26	66	F	At home	No. 17	.....	.....	.....
27	23	F	Housewife	.....	Well	Dairy X	At home
28	4	F	At home	.....	Well	Dairy X	At home
29	20	F	Laundry marker	.....	Well and city....	Dairy X	At home
30	45	M	Carpenter	No. 31	Well and city...	?	At home
31	1½	M	At home	.....	Well	Dairy X	At home
32	10	M	School boy	No. 31	Well	?	At home
33	12	M	School boy	.....	Well	?	At home
34	8	F	School girl	No. 31	Well	?	At home
35	6	F	School girl	No. 31	Well	?	At home
36	4	M	At home	No. 31	Well	?	At home
37	14	M	School boy	No. 31	Well	?	At home
38	60	F	Housewife	No. 10	City	Dairy X	At home
39	16	M	†Teamster	.....	Well	Dairy X	At home
40	29	F	Housewife	.....	City	Dairy X	At home
41	40	F	Housewife	.....	Well	Dairy X	At home
42	19	M	Cook	No. 1-2	Well and city..	Dairy X	At cafe
43	35	F	Housewife	.....	City	Dairy X	At home
44	4	F	At home	.....	City	Dairy X	At home
45	30	M	Foundry man	No. 44	City	Dairy X	At home
46	31	F	Housewife	No. 44	City	Dairy X	At home
47	23	M	Machinist	.....	City	Dairy X	At home
48	45	F	Seamstress	(Imp.)	.....	.....	.....
49	9	F	School girl	(Imp.)	.....	.....	.....

§Son of Dairyman X.
†Occasional driver on route of Dairy X.

Cases 47, 25, 29, 42 and 23 had been out of town preceding their illness, but it is clear that all other cases contracted infection in Newton, and judging from the relationship of the preceding cases, in time of onset to the others, they also are of local origin. Case 79 is however, clearly imported. Eight cases of this group are certainly contact infection and three more may be.

Of the total cases to date, 20 were sole users of city water and 12 were sole users of well water, while 13 used both. 36 of the total cases were patrons of X dairy, previously mentioned, 24 using the milk as a beverage and 10 only on cereals, while 2 denied its use, though the implicated milk was received into their home. The other potential routes of infection considered and mentioned in the previous reports do not show any particular incidence of infection among their consumers.

This secondary outbreak contains cases some of whom are due to infection received from contact in homes wherein exist cases of typhoid, others to a continuation of the transfer of infection along milk route X, probably by bottles. It would appear from these last cases that infection was probably received somewhere between August 2nd to 12th.

In the preceding reports I have made recommendations sufficient to have controlled the present situation. No additional recommendations were made except that the city officials were urged to issue directions for the prevention of the disease as a small circular and have it distributed to each home.

INVESTIGATION NO. 4 SUMMARY.

Typhoid fever in Baxter and surrounding country, Jasper county, Iowa. By Dr. Mark F. Boyd, August 1, 1916.

By order from Dr. G. H. Sumner, Secretary-Executive Officer, State Board of Health, at request of Mr. Thorpe, mayor of Baxter, received by 'phone at Newton, July 28, 1916.

Reason—To determine source of infection of several cases of typhoid fever in and near Baxter and if the same have any relation to the Newton outbreak.

Epidemiologist learned of seven cases, visited and interrogated them as follows:

No.	Age	Sex	Residence	Onset (to bed)	Contact	Water	Milk
1	22	F	Country n. 3 mi..	July 30....	.....	Well—cis. and priv.	town—Baxter
2	15	F	Country n. 2½ mi..	June 17....	No. 3	Well—cis. and priv.	town—Baxter
3	15	F	Baxter	§June 7....	.....	Well—cis. and priv.	town—Baxter
4	7	F	Country sw. 6 mi.	July 30....	.....	Well—cis. and priv.	town—Baxter
5	18	F	Country sw. 4 mi.	July 7....	.....	Well—cis. and priv.	town—Baxter
6	18	F	Country w. 2½ mi.	July 12....	No. 2	Well—cis. and priv.	town—Baxter
7	15	M	Baxter	June 8....	.....	Well—cis. and priv.	town—Baxter

§Last Illness.

The cases in Baxter correspond to an annual morbidity rate of 3.4 per 1,000, while for Independence township, outside of Baxter, the rate is 6.7 per 1,000. It is thus seen the rate for the country portion of the township is nearly twice that for Baxter.

Six of the cases are in young girls. All the country cases had been in Baxter preceding their illness. It appears from this that if infection had been received from a common source it was one encountered in Baxter. None of the cases had been to Newton and the present prevalence does not seem to have any relationship to the disease here. The onsets of the cases are scattered over a period of two months. This circumstance makes it appear unlikely that the infection of these individuals took place simultaneously, and hence reduces the probability that infection was received from a common source.

Three and seven, the only cases living in Baxter, first felt ill about the same time. Case 2 had been in contact with 3 in the early stages of the disease and case 1 had been in contact with case 2. This was the only definite contact ascertainable, but from the incidence of cases in young girls, it appears further and wider contact may have existed. Cases 1 lived but half mile from case 2, but contact is denied. Case 5 has been at the nearby home of a relative, in whose family typhoid occurred 4 years ago. Previous to cases 3 and 7, there occurred in a Baxter family, an ill defined illness, which was suspected to be typhoid. This family lived across the street from case 3. No doctor was in attendance and no precautions were taken. Permission to secure blood specimens from the patients was refused.

All cases had consumed water from various wells in Baxter. Cases 2, 3 and 7 had consumed water from the N. Main Street public well and case 1 probably had. Cases 1, 3, 5 and 7 had also consumed water from various private wells in town, and may have consumed water from the two public wells. The two public wells are N. Main Street well, and the W. State Street well. Laboratory examination of both shows them to be highly contaminated, though their immediate surroundings are fair.

Milk, ice cream, and other foods do not appear to have any relationship to the cases. Fly borne infection, from the sick room of case 2, may have carried the organisms across the half mile of intervening space to case 1.

Conclusions—(1) These cases have not arisen as the result of the simultaneous exposures of these individuals to some common infected article of food or drink as might be expected from the suggested relationship by their age and sex. This is indicated by their widely scattered onsets.

(2) While all the cases have been in Baxter preceding their illness and it is possible that infection may have been received in town, yet if such had been the case we would expect that the number of cases living in town would be greater than those living in the country, but as a matter of fact, the number of cases is nearly twice among those living in the country as it is among residents of Baxter. From this we are forced to conclude that the water of two of Baxter's public wells is heavily contaminated from fecal sources, yet the incidence of typhoid cases does not indicate infection has been received from this source.

(3) Case 6 probably received infection from case 2, while case 2 probably received infection from case 3. Case 1 may have received infection from case 2 through the agency of flies. Case 5 may have received infection from some typhoid carrier among her relations. No explanation can at present be offered to explain the sources from which cases 3 and 7, living in Baxter, received infection, unless the cases of ill-defined illness previously mentioned, were really typhoid. Fly carriage of infection would then be likely. Cases 4 and 5 do not appear to have received their infection through the channels of contact above described.

Recommendations—In order to prevent the spread of typhoid fever following its introduction, and to reduce the opportunity for its spread from unrecognized cases or carriers of the disease, I have the following recommendations to make to this Board:

(1) Since the majority of the surface wells in the city are probably as badly contaminated as those examined, Baxter should have a municipal supply of water obtained from sources secure from contamination.

(2) If a municipal water supply is obtained a sewer system should also be installed, in order that excreta may be removed from the town to a place where it may be safely disposed, or else the Board should require the universal adoption in Baxter of the type of sanitary privy recommended in the rules and regulations of the State Board of Health.

(3) This Board should require that physicians promptly report to it any cases of typhoid fever within Baxter and should further require that such patients be properly isolated, that their discharges are properly disinfected before disposal and that their isolation quarters are well screened.

(4) Milk or other dairy products should not be permitted to be sold from premises upon which exists a case of typhoid fever.

(5) Typhoid carriers or the nurse of typhoid cases should not be allowed to prepare food to be eaten by others.

(6) Manure piles and garbage should be removed at intervals of not greater than a week, in order that fly eggs laid therein may not develop to adult flies.

INVESTIGATION NO. 4 SUMMARY.

Typhoid fever, Maurice, Sioux county, Iowa. By Dr. Mark F. Boyd, August 3-4, 1916.

By order from Dr. Guilford H. Sumner, Sec.-Exec. Officer of the State Board of Health, received by phone August 2, 1916.

Reason—To determine source of infection of several cases of typhoid fever.

History—Maurice has been free from typhoid since the summer of 1914. At that time several cases occurred, among whom were the wife, daughter and niece of the present case 1. The outbreak was not investigated but from the history was apparently due to contact.

Epidemiologist with Dr. O., the Health Officer, visited the following cases:

No.	Age	Sex	Occupation	Residence	Took to Bed	Note
1	43	M	Merchant	Maurice	July 13	
2	12	M	Schoolboy	Maurice	July 9	Son of No. 1
3	10	F	Schoolgirl	Maurice	July 5	Daughter of No. 1
4	74	M	Retired	Maurice	July 16	Father-in-law of No. 1
5	11	F	Schoolgirl	Maurice	July 18	
6	13	M	Schoolboy	Maurice	July 26	
7	9	F	Schoolgirl	Maurice	July 26	Sister of No. 6
8	60	M	Retired	Maurice	July 23	
9	13	M	Schoolboy	Maurice	July 16	
10	28	M	Farmer	Country	July 16	
11	11	F	At home	Country	July 21	
12	15	F	Schoolgirl	Orange City	July 30	
13	13	M	Schoolboy	Orange City	July 31	

Case No. 3 was the first to develop, and took to bed on July 5th, after feeling ill a few days. The next two cases to develop were her brother and father respectively. By weeks the onset of the cases are as follows:

July 2	1
July 9	2
July 16	7
July 23	2
July 31	1
	13

Their age and sex distribution is as follows:

AGE PERIODS

	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	Total
Male	2	4	1		1		1	1	8
Female		3							5
	2	7	1		1		1	1	13

Neither the sex nor any age groups show a preponderance of cases

Cases 1, 3, 4, 6, 7 and 9, residing in Maurice had not been outside the town. Case 3 was the first case to develop. Case 2 was in Orange City two weeks before he took sick, and case 8 was to the same town three days before he took sick, and case 8 was to the same town three days before he took sick, probably while he was feeling ill. He was also in Hawarden and Sioux Center on the same date. Case 5, living in Maurice, had gone to the country for a few days and took sick after being there two days. Cases 10 and 11, living in the country adjacent to Maurice, were in Maurice 12 and 16 days respectively before the onset of their illness. Cases 12 and 13, living in Orange City, were in Maurice 16 and 26 days before the onset of their illness. The out-of-town patients were in Maurice in the period between the 3rd to the 5th of July. It therefore seems clear that the residents of Maurice contracted the disease within the town and that the out-of-town patients had been in Maurice at a time, judging from their development of the disease, when they may have received infection.

Case 3 represents the first case of the present outbreak. Cases 1 and 2, developing in the next week, appeared in the brother and father of case 3, who had been in contact with her during the early part of her illness. Case 4, is the grandfather of No. 3, and had been with her during the early period of her illness under opportunities that would permit of the contraction of the disease. Cases 5, 6, 7 and 9 were playmates of cases 2 and 3 and had been in contact with these individuals at about the time of the onset of case 3. Case 8 was an intimate friend of case 4 and had visited with him during the early stages of his illness. Case 10 had been in contact with case 3 at the store of the latter during early July. Case 11 is a niece of case 1 and had been at the home of cases 1, 2 and 3 on the day before case 3 took to bed. Cases 12 and 13, living in Orange City had been at the home of cases 1, 2 and 3 between the 3rd to the 5th of July, which period marks the onset of case 3. It is clearly evident, that excluding the first case of the disease, No. 3, all those developing subsequently may be traced to the cases existing in this family.

A consideration of the possibilities for the contraction of infection through foods, flies, ice cream, milk, drinking water and swimming shows that none of these factors are common to all of the cases, and hence may be excluded from consideration. Cases 1, 2, 3, 4, 9, 11, 12 and 13 had consumed well water from the premises of cases 1, 2 and 3. Examination of this water shows the well to be highly contaminated and not fit for consumption. The well has a tight top and it is not clear from what source excremental material could gain entrance. But the manner in which the cases have developed, together with all other circumstances of the epidemic, indicate that infection has undoubtedly been passed directly from person to person, rather than through the indirect agency of infected water.

It is not clear from what source case 3, the first of the present epidemic, contracted the disease, since she had not been outside of Maurice preceding her illness. She has been in close contact with four persons who have had typhoid fever within years, three of whom had it during 1914, and were a part of a small epidemic, apparently due to contact. These individuals are her mother, (14), sister (15), and cousin (16), respectively. The fourth (17), person is a distant cousin, who had typhoid four years ago, while abroad. During the preceding June the mother of case 3 was confined to her bed by an ill defined illness the chief characteristics of which were pleurisy and a bhrombo-phlebitis. During her illness, from which she has not yet entirely recovered, she was nursed by her husband, case 1, and her niece, the cousin before mentioned. This last individual has been away from Maurice for several months and had returned but a short time before. It therefore seems probable that one of these four individuals may be a carrier, but which one cannot be decided until a series of bacteriological examinations of the feces and urine of each have been made.

A small circular giving complete directions whereby the spread of typhoid fever may be prevented was prepared and at the direction of your Mayor was printed, and distributed to each home in the town For detailed directions reference should be made to the circular. Certain

further recommendations, capable of execution by this Board, will also materially assist in the prevention of the dissemination of typhoid fever.

(1) Maurice could well afford to have a public water supply, whose healthful quality should be properly safeguarded and which could be distributed to each home in town.

(2) This Board should prescribe a type of privy for adoption in town, and which have a water tight vault and a fly and vermin tight superstructure. All property owners should be compelled to install such a privy.

(3) Manure and garbage should not be permitted to accumulate for periods greater than one week. Otherwise it will be impossible to eradicate flies, as the only satisfactory method to control them is through the eradication of their breeding places.

(4) Foods displayed at retail should be protected from flies.

(5) This Board should compel the abandonment, as a source of drinking water of any wells, which upon examination are found to be contaminated.

INVESTIGATION NO. 5 SUMMARY

Diphtheria in Ellsworth Township, Emmet county, Iowa. By Dr. Mark F. Boyd, September 13-19, 1916.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, received by 'phone September 12, 1916 at request of Board of Trustees of Ellsworth Township.

History—Cases have not appeared outside Sunny Valley School district. The following cases occurred:

No.	Patient	Onset	Physician	Outcome	Release
1	Ellen V.	4-21	A. A.	Death	Second day
2	Mrs. V.	4-22	A. A.	Recovered	Second day
3	Esther V.		A. A.	Recovered	Second day
4	Josie W.	6- 8	B. C. C.	Recovered	Cult.—40 days
5	Ella S.	6-14	C. E. B.	Recovered	Cult.— 9 days
6	May R.	8-30	C. E. B.	Recovered	Cult.—3 weeks
7	Mrs. R.	9- 1	C. E. B.	Recovered	Cult.—3 weeks

Cases 4 and 5 are reported to have sat behind case 1 at school. Case 6 had been at the home of case 4, two weeks preceding onset, but after release of 4. Cases 6 and 7 in same household.

Epidemiologist found that Township Trustees had never organized as a Board of Health or appointed a Health Officer. As a result they did not know what policy to follow. The different physicians concerned seemed to be working at cross purposes.

Epidemiologist cultured the pupils (4) and teacher of the Sunny Valley school. Ascertained the names of the pupils who had been in attendance during the previous term, visited their homes and cultured them. In homes where cases of diphtheria had existed, all inmates were cultured. A total of 27 cultures were taken for the detection of carriers, but none were found.

Met with Township Trustees in Estherville hotel and got them to organize as Board of Health and appoint a health officer. Dr. R. C. Coleman selected. Gave them a talk on the control of diphtheria and the rules and regulations of the State Board of Health, and explained to them their power and duties.

Health Officer instructed to repeat culture taking if further cases should arise, among all persons whom patients had been in contact for the two weeks preceding his illness.

INVESTIGATION NO. 6 SUMMARY

Diphtheria in Montour, Tama county. By Dr. Mark F. Boyd, November 2-4, 1916.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer State Board of Health at request of Mr. J. C. Stevens, mayor, received by mail, October 21st.

Reason—To assist local officials in the control of diphtheria.

History—During October five households were invaded with a total of perhaps ten cases. Locally cases were supposed to have contracted infection from a typical case not quarantined.

Epidemiologist spoke on diphtheria and its control before a joint meeting of the Board of Health and School Board. Asked that the pupils be called to school on the 3rd for culturing. All school children with the exception of five absentees cultured on the 3rd and also members of households which were under quarantine and which had been quarantined, also members of households in which suspected case existed. A total of 106 cultures were taken. Examination of these showed the suspected case referred to was a carrier and indicated one other healthy carrier. Eight positive cultures were obtained from members of quarantined households.

Results—Recommended handling of the cases and carriers according to the revised rules of the board. Also gave instruction concerning the administrative supervision of the school children. Schools reconvened November 6th.

INVESTIGATION NO. 7 SUMMARY

Scarlet Fever in Prairie Township, Delaware county. By Dr. Mark F. Boyd November 6, 1916.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer State Board of Health, at the request of Dr. H. A. Dittmer, member, State Board of Health, received by 'phone No. 3.

Reason—To confer with local officials relative to the control of scarlet fever in the country.

History—Eight families in two school districts of Prairie township invaded. Schools of township closed. One family quarantined in neighboring township of Coffin's Grove. Six cases reported from children of two schools in Manchester, the origin of infection being traced to rural sources. City schools closed until November 13.

Epidemiologist met with township trustees of Prairie township. Found them alert to their responsibility. Explained to them the means by which scarlet fever is spread and went over the rules and regulations of the State Board of Health concerning the control of scarlet fever. Urged

especial care in the disposal of milk from quarantined farms. Met with the school board of Manchester and advised that a system of school investigation be instituted following the re-opening of the schools, and outlined a method in detail which the Board said they would adopt. Explained the means by which scarlet fever is transmitted. Urged both Boards to ask for assistance if needed.

INVESTIGATION NO. 8 SUMMARY

Diphtheria in Little Rock, Lyon county. By Dr. Mark F. Boyd November 10-12, 1916.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health at request of Mr. Van Eaton, mayor, received by 'phone November 9, 1916.

Reason—To diagnose suspected diphtheria and assist local officials in control of the same.

History—Since July 22, 10 households have been invaded by the illness in question. The patients in the first 6 households invaded were attended by Dr. F. J. S., who took cultures, diagnosed diphtheria and reported same to mayor. The health officer, Dr. R. B. R. did not concur in the diagnosis and did not take cultures. As a result of health officer's opinion these cases were not quarantined. On November 1 the first quarantine was established.

Epidemiologist found three homes quarantined. The cases are as follows:

No.	Att.	Onset	Quar. Est.	Contact	Doctor	Diagnosis
1	Oct. 16....	July 17..	None	Ashton July 4	F. J. S.....	Diphtheria
2	Oct. 19....	July 22..	None	No. 1.....	F. J. S.....	Diphtheria
3	Oct. 23....	July 25..	None	No. 2.....	F. J. S.....	Diphtheria
4	Oct. 25....	Aug. 2..	None	No. 2.....	F. J. S.....	Diphtheria
5	Oct. 21....	July 30..	None	No. 1.....	F. J. S.....	Diphtheria
6	Oct. 10....	Aug. 18..	None	No. 1-3.....	F. J. S.....	Diphtheria
7	Oct. 8....	Oct. 29..	Nov. 11.....	No. 6.....	R. B. R.....	.....
8	Oct. 11....	Oct. 30..	Died	No. 7.....	R. B. R.....	.....
9	Oct. 3....	Nov. 2..	Nov. 9.....	No. 7.....	F. J. S.....	Diphtheria
10	Oct. 10....	Oct. 31..	Nov. 2.....	School	F. J. S.....	Diphtheria
11	Oct. 12....	Nov. 6..	Nov. 9.....	No. 12.....	F. J. S.....	Diphtheria
12	Oct. 7....	Nov. 2..	Nov. 11.....	No. 2-1-6.....	R. B. R.....	.....
13	.....	Nov. 11..	Nov. 11.....	No. 12.....	R. B. R.....	Diphtheria

Cases 2, 3, 4, 5, 6, 7, 8 and 9 are all related and family contact is close

Epidemiologist established diagnosis of diphtheria bacteriologically. Cultured all children attending school and various members of households of cases 2, 7, 8, and 12. Took 170 cultures. Incubated and examined them. Found that 7, 8 and 12 had diphtheria, and reported them. Found 14 carriers in the schools. Met with Board of Health and School Board and went over rules and regulations of the State Board concerning diphtheria and general quarantine, with them. They are now anxious to get the disease eradicated.

INVESTIGATION NO. 9 SUMMARY

Typhus Fever at Fort Madison, Lee county, Iowa, November 18-24, 1916. By Dr. Mark F. Boyd.

By order of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health. Received by 'phone November 17, 1916.

Reason—To investigate origin and prevalence of the disease and to organize methods for its control and eradication.

History—Presence of five cases in the Sante Fe hospital at Fort Madison reported to S. B. of H. November 17, by health officer of Ft. Madison.

Epidemiologist found seven cases existing. Disease imported by case 1, an incubation period, from El Paso, Texas. Four cases in Mexicans and three cases in white hospital employees. All secondary cases due to infection received from first case before nature of illness recognized. One death among white cases. Infection carried into Princeville and Surrey, Illinois, by two Mexicans from hospital. Six Mexicans in Burlington yards at Ft. Madison exposed. Diseases under control in Sante Fe hospital.

Got Sante Fe officials to undertake delousing of their Mexican laborers in Iowa according to satisfactory methods. Train Equipment designed for this work. One car for sterilizing bedding and clothing and two bath cars, with one car for disinfecting crew. Deloused Mexicans given certificates. Sick Mexicans from Illinois not to be brought back into Iowa.

INVESTIGATION NO. 10 SUMMARY

Diphtheria at Nevada, Story county, Iowa, November 26-28, 1916. By Dr. Mark F. Boyd.

By order of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, at request of local board, received by mail November 26, 1916.

Reason—To assist the local authorities in control of diphtheria epidemic.

History—Since the middle of October, 1916 seven households had been quarantined. Seven cases reported. Two deaths. All cases among pupils attending old high school building. There was an unusual prevalence of severe sore throat antedating the diphtheria epidemic and running parallel with it.

Epidemiologist met with the local board and the school board and arranged for culturing the pupils of this school. Secured histories of the reported cases, as follows:

No.	Age	Sex	Onset	Quit School	Grade	Contact	Released
1	10	F	Nov. 15.....	Nov. 15.....	5th	School & No. 2	Nov. 1
2	9	F	Oct. 18.....	Oct. 18.....	4th	School	Died Oct. 23
3	10	F	Oct. 21.....	Oct. 23.....	4th	School & No. 2	Nov. 12
4	5	M	Oct. 20.....	Oct. 20.....	Primary	School	Nov. 12
5	11	M	Nov. 13.....	Nov. 13.....	5th	School	Died Nov. 21
6	11	F	Oct. 18.....	Oct. 18.....	5th	School	Nov. 14
7	6	F	Nov. 20.....	Nov. 20.....	Primary	School	.....

With assistance of health officer secured 285 cultures from this school. Eleven positives found, five of which were from children having the sore throat previously mentioned. The janitor found to be a carrier and the teacher of the primary grades reported with diphtheria by her physician.

Local officials anxious to control situation and were given advice concerning methods and details and the administration of quarantine.

INVESTIGATION NO. 10 SUMMARY.

Diphtheria in Nevada, Story county, Iowa, Feb. 20-21, 1917, by Dr. Mark F. Boyd.

By Order—From Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, at request of Mr. Hall, the mayor, received by 'phone February 19, 1917.

Reason—To assist local officials in controlling a second appearance of diphtheria.

History—Following the measures inaugurated during November and December, 1916, the epidemic was rapidly brought under control and apparently extinguished. About the middle of February the following cases were reported as diphtheria to the mayor by the attending physician:

No.	Age	Sex	Onset	Quit School	Grade	Contact	Outcome
1	9	M	Feb. 12.....	Feb. 12.....	Third	.....	Fatal Feb. 17
2	5	F	Feb. 14.....	At home	.....	.....	Convalescent

Bacteriological examination of cultures from these cases failed to reveal diphtheria bacilli, though the clinical diagnosis in case No. 1 would appear to be justified.

Epidemiologist—With assistance of health officer and two other physicians again cultured the pupils of the school attended by these cases or members of their family. 207 cultures were secured and examined. Two carriers were detected, one of whom was recognized as a carrier at the time of the previous investigation in November, 1916, and who had been released from isolation after having given two consecutive negative cultures. A sister of case 1 attended the same room at school as did this chronic carrier.

The local officials were advised to follow the recommendations made to them in December, 1916, the results of which gratified them exceedingly.

INVESTIGATION NO. 11 SUMMARY.

Diagnosis obscure case suspected communicable disease, Charles City, Floyd county, Iowa, March 31, 1917, by Dr. Mark F. Boyd.

By order from Dr. G. H. Sumner, Sec.-Exec., Officer, State Board of Health, at request of Dr. J. H. McLeod, mayor, received by 'phone March 30, 1917.

Reason—Differential diagnosis in a case considered to present symptoms indicating presence of both poliomyelitis and cerebro-spinal meningitis.

History—Case 4-year old child, recently removed from Oskaloosa. One of four children. On the 26th took sick with fever and vomiting, broncho pneumonia observed on the 28th. At the same time a flaccid paralysis of the left leg was present. Lumbar puncture made. Death on the 29th. No other similar case known in the city.

Epidemiologist examined spinal fluid preserved by the health officer, Dr. Neimack. Fluid turbid, with marked sediment. Smears showed large numbers of pus cells, together with abundant Gram positive, triangular, encapsulated diplococci, having the morphology of the pneumococcus.

Made diagnosis of a pneumococcic meningitis secondary to a broncho pneumonia.

INVESTIGATION NO. 12 SUMMARY

Diagnosis two cases acute febrile disease, State Industrial School for Boys, Eldora, Hardin county, Iowa, April 10-11, 1917, and search for meningococcus carriers April 19-22, 1917, by Dr. Mark F. Boyd.

By request Mr. Kuser, Supt. Industrial School, approved by Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, over 'phone April 10, 1917.

Reason—To establish diagnosis between poliomyelitis and cerebro-spinal meningitis in two cases of acute illness at the Industrial School.

History—Case No. 1, Boy age 16. Onset March 26, with sore throat, headache and chill, malaise, nausea and fever, meningeal symptoms rapidly developed.

Case 2, boy age 11, onset April 8, with rigor, headache, emesis and delirium, with meningeal symptoms.

Case 3, boy age 18, onset April 9, with sore throat, fever, emesis headache, some meningeal symptoms.

No paralysis in any.

Epidemiologist found that cases presented definite symptoms of meningeal irritation, double Kernig, stiff neck, etc. Lumbar puncture performed on each. From cases 1 and 2, turbid spinal fluid was removed under tension in which the *Diplococcus meningitidis* was found. No fluid secured from case 3. Meningitis serum administered April 13, intraspinously. Returned to school April 19, and following week took and examined nasopharyngeal cultures from 470 boys, inmates of school, for the detection of meningococcus carriers. None were found. On April 26, at request of Dr. Kauffman of Union, went to that place from Eldora to observe two cases of suspected meningitis, which was found to be pneumococcal, secondary to pneumonia.

Recommendations—*First visit*—(1) Early and liberal administration in cases of meniagitis serum intraspinously. (2) Effective isolation of cases in hospital. (3) Employment of trained nurses for this duty. (4) Conduction of search for meningococcus carriers.

Second Visit—(1) Various methods for avoiding transfer of nasopharyngeal secretions between inmates.

Results—Up to May 1st, no further cases had appeared at either the boys' school or Union.

INVESTIGATION NO. 13 SUMMARY.

Control of diphtheria in the Soldier's Orphan's Home, Davenport, Scott county, Iowa.

By request from Mr. Dixon of the State Board of Control, received May 22nd and reported to office of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, on same date.

Reason—To find carriers and missed cases of diphtheria among the inmates.

History—Since the first of January, 1917, until May 23, the following diagnosis of diphtheria have been made by Dr. Allen:

Month	Positive Bact.	Negative Bact.
January	0	1
February	0	3
March	1	3
April	8	22
May	1	14

All cases quickly responded to the prompt administration of antitoxin.

Epidemiologist cultured all the children and staff of the institution, taking 539 cultures, of which 45 were found to be positive. The positive cultures were classified as follows:

Individuals previously recognized as infected	6
Mild cases detected	3
Convalescent carriers previously discharged	3
Healthy carriers	33

Recommendations—(1) All infected persons should be isolated until at least five consecutive negative cultures are secured. (2) The immunity status of all infected individuals should be determined by the Schick test. Those susceptible should be protected by antitoxin. (3) All new inmates should be detained for at least 2 weeks in isolation before mingling with the other children and their freedom from diphtheria bacilli established. (4) Other recommendations of a general character were made.

CONFERENCE NO. 14 SUMMARY.

With local board of health of Garner, Hancock county, Iowa, June 12, 1917, by Dr. Mark F. Boyd.

By order from Dr. G. H. Sumner, received over 'phone June 12.

Reason—To settle dispute relating to the release of quarantine in scarlet fever.

History—A Garner physician, reported by himself as having scarlet fever, was quarantined June 1, and released by the mayor on June 9, despite the protest of the board of health, after being told by the physician that his own recovery was complete. This was the last reported case of an epidemic of sixteen cases occurring between April 12 and June 1st. Infection was imported from Dubuque and was principally exchanged in school.

Epidemiologist ascertained that the local quarantine practices had been very lax, and illegally established and that therefore the board could hardly hope to bring successful prosecution for violation of quarantine, since they neither had required written reports of cases or established quarantine according to the legally recognized method. Advised a general search for mild cases, but since none had appeared for nearly two weeks, they believe the disease has subsided and assistance was declined.

CONFERENCE NO. 15 SUMMARY.

With Health Officer, Brooklyn, Poweshiek county, Iowa, June 22, 1917, by Dr. Mark F. Boyd.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer State Board of Health, at request of Dr. Barker, health officer, received by 'phone June 21

Reason—Differential diagnosis between German measles and scarlet fever.

History—German measles has been epidemic in and around Brooklyn for the last 5 or 6 weeks. Within the last three weeks four homes have been quarantined for scarlet fever, in two of which the case was not detected until about the 2nd week after the onset. Three homes at present under quarantine.

Epidemiologist in company with health officer and attending physician, visited the homes which were under quarantine and inspected the cases. Confirmed the diagnosis of scarlet fever.

Recommended—(1) That Board of Health order a house to house search for the detection of unrecognized cases and offered assistance. (2) That borderline cases (i. e. uncertain scarlet fever or German measles) be reported and quarantined until a definite diagnosis could be made.

INVESTIGATION NO. 16 SUMMARY.

Typhoid Fever in Baxter, Jasper county, Iowa, June 28, 1917, by Dr. Mark F. Boyd.

By direction Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health. At request of Mr. Thorp, mayor of Baxter, received by 'phone June 27, 1917.

Reason—To determine source of present typhoid fever in Baxter.

History—Typhoid fever in Baxter was investigated by Epidemiologist in August, 1916. Since March, 1917, 5 cases have occurred, onsets as follows: March, 1 case; April, 1 case; June, 3 cases. One of these lives in country 1 mile from Baxter.

Epidemiologist investigated all cases. Could eliminate water, milk, other food and flies. All cases gave a history of contact with the case of March, 1917. This case apparently received infection from eating a meal prepared by a girl who had typhoid in September, 1916. Steps are being taken to determine if she is a carrier.

Recommendations—Again affirmed recommendations of preceding report, especially (1) Isolation of typhoid cases. (2) Proper collection and disposal of excreta of typhoid cases. (3) Vaccination of typhoid contacts. (4) Sanitary survey of private wells in Baxter. (5) Installation of a municipal water supply and sewerage system.

INVESTIGATION NO. 17 SUMMARY.

Typhoid Fever in Carney, Polk county, Iowa, by Dr. Chester Demaree, August 8th, 1917.

By order from Dr. Guilford H. Sumner, Sec.-Exec. Officer, State Board of Health, received by telephone, August 7th, 1917.

Reason—To determine source of infection of several cases of typhoid fever.

History—A case of typhoid fever developed in the mining camp of the Saylor Coal Mine about July 7, 1917. Prior to this time the community had been free from typhoid for some time.

Epidemiologist learned of three cases of typhoid fever in the camp from Dr. Guilford H. Sumner and U. S. Public Health official at that place. They are:

No.	Age	Sex	Occupation	To Bed	Water	Ice Cream
1	17	M	Miner	July 16	Wells No. 1 & 2	Corner Store
2	17	M	Miner	July 21	Well No. 2	Corner Store
3	20	M	Miner	Aug. 6	Well No. 2	Corner Store

The cases were located in the northern part of the camp and occurred in two families, the dwellings of which were separated by a distance of about twenty rods.

The first case (case No. 1) occurring in a colored family had been out of the camp five days prior to the development of the first symptoms of the disease. In no way could there be established and definite relationship between this case and contact with any other case, or contaminated food supply or other source. Limited inquiry failed to determine any previous cases of bowel trouble among the camp dwellers, or of any individuals from without having visited the camp who had suffered from any disease suspicioned as being typhoid. The second case (No. 2) occurring two weeks later bore somewhat the relation as a contact of case No. 1. The patients being employees and associated in the same mine and frequenting the same open and carelessly exposed latrine in the mine, in which circumstance there was chance for contamination of the feet of the men and in this manner infection occur indirectly. Case No. 3 being in the same family was considered a contact of case No. 2.

All cases used water from three of the eighteen or twenty wells within this town. An inspection of these wells, particularly the three in relation to the cases of typhoid, and as well the results of the laboratory examinations from them indicated the supply was polluted, and for the time being unsafe for drinking purposes.

Food including milk, butter, and also ice cream does not indicate any probable relationship on account of the length of period of time between the outbreak of the different cases.

So far as this investigation reveals the primary source of the outbreak could not be determined. Cases Nos. 2 and 3 are regarded as contracts of cases Nos. 1 and 2 respectively.

General advice, concerning the prevention of typhoid, particularly pertaining to the boiling of the water, screening of dwellings and disposal of night soil, was arranged to be given in public to the dwellers of the camp by the mine superintendent and U. S. Public Health Officials. Also all privies were ordered treated with lime, and the use of sanitary closet instituted as soon as possible following their construction.

INVESTIGATION NO. 18 SUMMARY.

Typhoid Fever, Scott township, Fayette county, and Hazelton and Buffalo township, Buchanan county, by Dr. Mark F. Boyd, September 4-7, 1917.

By order from Dr. Guilford H. Sumner, Sec.-Exec. Officer, State Board of Health, at the request of Board of Health of Scott township, Fayette county, received by 'phone August 30, 1917.

Reason—To determine source of infection of several cases of typhoid fever.

Epidemiologist learned of additional typhoid in Buffalo and Hazelton townships, in Buchanan county, which also investigated. Essential history is as follows:

Residence indicated on Map:

No.	Age	Sex	Occupation	To Bed
1	23	M	Farm hand	August 4
2	21	F	House work	August 8
3	20	M	Farmer	August 14
4	11	F	At home	August 23
6	25	M	Farm hand	August 24
7	21	M	Farmer	September 2
8	34	M	Farmer	July 31
9	38	M	Farmer	August 16
10	60	F	House work	August 30
11	69	M	Farmer	August 21
12	17	F	House work	August 12
13	39	F	House work	August 15
14	29	F	House work	August 17
15	40	F	House work	September 2
16	16	M	Farmer's son	August 21
17	15	M	Farmer's son	August 16

1- 4 inclusive—Scott Township.
6- 9 inclusive—Buffalo Township.
10-17 inclusive—Hazelton Township.

Cases 1 and 8 in Scott and Buffalo townships respectively probably contracted infection at Aurora July 4th. The remaining Scott township cases (2-3-4) developed through contact with case 1. The remaining Buffalo township cases (7-6-9 and others) are all traceable to case 8, through either the medium of contact of fly transmission. The Hazelton township cases (10-11-12-13-14-15-16-17) are ascribable to the consumption of infected butter or buttermilk through infection derived from a single lot of contaminated cream from the premises of case 8 in the adjoining township and churned in the local creamery.

Recommendations—(1) No food except that produced on one's own place should be eaten raw or without re-cooking: (a) If it has not been adequately protected from flies while for sale, or (b) If it is ordinarily eaten raw following purchase.

(2) For the immediate present avoid ice cream or butter unless its manufacturers can demonstrate that the cream is pasteurized before freezing or churning.

(3) Keep the flies out of the home by screening and swatting. Destroy their breeding places in the manure piles and remove from their reach their outdoor feeding places, the garbage and the outside privy vaults.

(4) Stay away from premises upon which there is a case of typhoid fever.

(5) Milk, cream or butter should not be sold from premises upon which exists a case of typhoid fever.

(6) The local boards of health should require practicing physicians to report to them all cases of typhoid fever arising within their jurisdictions.

(7) Local boards of health should insist that all typhoid patients be kept carefully isolated, that both their feces and urine be properly disinfected according to the regulations of the State Board of Health before disposal, and that care be taken to avoid contamination of farm water supplies with the same.

(8) The patient's nurse should not engage in the preparation or handling of food to be eaten by others.

(9) The patient's dishes and bedding should be carefully disinfected before taken from the sick room.

(10) Privies should be made fly tight and wells should be so constructed so as to exclude surface contamination.

INVESTIGATION NO. 19 SUMMARY.

Typhoid Fever, Fremont township, Fayette county, by Dr. Mark F. Boyd, September 6, 1917.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, at request of Board of Health of Fremont township.

Reason—To determine source of infection of several cases of rural typhoid fever.

History—There has not been any typhoid in this township for some time preceding. During August two homes at extreme northern and southern borders of the township were invaded, six cases arising in one home. The cases are as follows:

No.	Age	Sex	Occupation	Residence	To Bed
1	14	F	At home	South of Westgate	Aug. 26
2	61	M	Farmer	North of Westgate	Aug. 25
3	28	M	Farmer	North of Westgate	Aug. 25
4	26	M	Farmer	North of Westgate	Sept. 2
5	22	F	Housework	North of Westgate	Aug. 24
6	19	F	Housework	North of Westgate	Aug. 20
7	16	F	Housework	North of Westgate	Aug. 20

Epidemiologist in company with Dr. Corlett of Westgate, visited these premises. All cases developed illness at about the same time, which is suggestive of a common source of infection. Inquiries failed to reveal any possibilities of infection having been contracted away from home, or through contact with any cases or carriers. The only food stuffs partaken of at probable time of infection which might have been infected were in both households, butter from the Westgate creamery and in the household having six cases, a can of salmon. Careful inquiry and investigation failed to reveal opportunity for infection having been derived from water, foods eaten away from home, flies, etc.

Recommendations—(1) No food except that produced on one's own place should be eaten raw or without recooking: (a) If it has not been adequately protected from flies while for sale, or (b) If it is ordinarily eaten raw following purchase.

(2) For the immediate present avoid ice cream or butter unless its manufacturers can demonstrate that the cream is pasteurized before freezing or churning.

(3) Keep the flies out of the home by screening and swatting. Destroy their breeding places in the manure piles and remove from their reach their outdoor feeding places, the garbage and the outside privy vaults.

(4) Stay away from premises upon which there is a case of typhoid fever.

(5) Milk, cream, or butter should not be sold from premises upon which exists a case of typhoid fever.

(6) The local boards of health should require practicing physicians to report to them all cases of typhoid fever arising within their jurisdiction.

(7) Local boards of health should insist that all typhoid patients be kept carefully isolated, that both their feces and urine be properly disinfected according to the regulations of the State Board of Health before disposal, and that care be taken to avoid contamination of farm water supplies with the same.

(8) The patient's nurse should not engage in the preparation or handling of food to be eaten by others.

(9) The patient's dishes and bedding should be carefully disinfected before being taken from the sick room.

(10) Privies should be made fly tight and wells should be so constructed so as to exclude surface contamination.

INVESTIGATION NO. 20 SUMMARY.

Diphtheria in Le Grande, Marshall county, by Dr. Mark F. Boyd, September 11-12, 1917.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, at request of Mr. Davis, mayor, received by 'phone September 10.

Reason—To culture children of consolidated school at Le Grande owing to exposure to diphtheria.

History—The rural townships surrounding Le Grande have a consolidated school situated in Le Grande. School started September 4. Case of diphtheria diagnosed in school boy living just outside of Le Grande, September 7. Three other boys in same family excluded September 7th. These later developed clinical diphtheria. Authorities considered it advisable to have the school children cultured. Schools had not been closed.

Epidemiologist cultured 168 school children and directed exclusion of absentees until cultures taken and reported. Also investigated cases previously noted and also one family 3 miles west of Le Grande just released from diphtheria quarantine, the children of which desired to enter Le Grande school.

Results—Examination of cultures in the laboratory showed 5 positive and 5 diagnosis reserved. 1 positive in the home 3 miles west of Le Grande, 3 in one Le Grande home and 1 in another. Investigation indicates that both invaded households noted above received infection from Marshalltown visitors who had sore throats at the time of visit.

Directed attention of authorities to regulations of State Board of Health concerning control of diphtheria carrier.

INVESTIGATION NO. 21 SUMMARY

Typhoid Fever, Oskaloosa, Mahaska county, by Dr. Mark F. Boyd, September 24-25, 1917.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer State Board of Health at request of Mr. J. G. Herrold, mayor.

Reason—To investigate several cases of typhoid fever.

History—Oskaloosa has had very little typhoid since the epidemic of 1912. Two cases occurred during June, 1917. During August and September nine cases occurred, seven of which had been reported to the health officer. They are as follows:

No.	Age	Sex	Address	Occupation	To Bed
1	26	M	201 1st Ave. W.	Carpenter	August 29
2	30	M	302 2nd Ave. W.	Express driver	August 27
3	24	M	212 A Ave. W.	Watch maker	September 4
4	24	F	1214 S. 2nd St.	Bookkeeper	September 7
6	.....	M	301 1st Ave. W.	Carpenter	September 2‖
7	.....	M	301 1st Ave. W.	Carpenter	August 12‖
8	18	F	109 3rd Ave. W.	Housewife	September 6
9	.....	M	Burlington, Iowa	Express messenger	August 30

‖Cases 6 and 7 quit work in Oskaloosa and went home to Ottumwa on these dates.

With the exception of 4 these are all confined to a limited area just west of the business district.

Epidemiologist investigated all the cases at present in Oskaloosa. Found that cases 6 and 1 appear to have contracted infection from case 7, while cases 3 and 9 also appear to have contracted infection from case 2. Case 2, 4 and 8 were sole users of well water. Cases 7, 2 and 4 had used water from a well across street from premises of case 1. This well while found to be contaminated, is not grossly so and moreover is widely used. Appears more probable that 7 contaminated some portion of the pump. Case 8 appears to have contracted infection from flies from the premises of cases 1, 6 and 7. Case 7, the first case, apparently received infection before he came to Oskaloosa, from Ottumwa.

Recommendations: (1) Urge the abandonment of the use of water from shallow wells within the city as long as careful supervision of the city water is exercised.

(2) The abatement of privies on premises where sewer connections are practicable.

All cases excepting 6 and 7 are hospitalized. No further cases have developed.

INVESTIGATION NO. 22 SUMMARY

Typhoid Fever, Albert City, Buena Vista county. By Dr. Mark F. Boyd, September 27-30, 1917.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health at request of Board of Health of Albert City.

Reason—To determine source of epidemic.

History—Albert City, previous to present epidemic has very rarely had any typhoid. During August and September, 1917, the present epidemic confined to males occurred.

Epidemiologist from the local physicians learned of the following cases:

No.	Age	Sex	Residence	Occupation	First Ill (Approximate)
1	23	M	6 mi. s. Albert City	Farmer	September 4
2	17	M	2 mi. s. Albert City	Farm hand	September 11
3	10	M	3 mi. se. Albert City	School boy	September 19
4	30	M	9 mi. ne. Albert City	Farmer	August 15
5	32	M	2 mi. nw. Albert City	Farmer	August 24
6	30	M	Albert City	Restaurant keeper	September 1
7	9*	M	Albert City	School boy	September 2
8	12*	M	Albert City	School boy	September 3
9	21	M	Albert City	Garage helper	September 11
10	29‡	M	Albert City	Garage repair man	September 1
11	47‡	M	Albert City	Blacksmith	September 8
12	30§	M	Albert City	Liveryman	August 20
13	20§	M	Albert City	Tiler	September 23

*Brothers.
‡Brothers but living in separate hospitals, deceased.
§In Iowa Lutheran Hospital, Des Moines.

The outbreak was not explosive but was confined to males exclusively. Cases 4 and 12 were the early cases of the outbreak. With the exception of cases 1 and 3 all had been more or less about a garage in Albert City conducted by case 10, and most had used water from a well in this garage. Cases 1 and 3 may have received infection indirectly from case 6, by either ice cream or food. Could eliminate milk, butter, ice cream (except 1 and 3) food (except 1 and 3) and flies. The garage well could have become contaminated from the garage toilet which was used by case 12, because of loose lining and close relationship to drain from septic tank into which toilet discharged. Case 12 could also have infected those about the garage through contact. Evidence indicates that case 12 is the primary case of the epidemic rather than case 4. The onset of case 12 was insidious and the disease of an ambulatory type and unrecognized for several weeks.

Recommendations: (1) A small circular of direction for general distribution was printed and circulated by the local Board.

(2) That a public water supply be secured at the earliest opportunity.

(3) That a sewerage system be installed at the earliest opportunity.

INVESTIGATION NO. 23 SUMMARY

Typhoid Fever, Clinton county, Iowa. By Dr. Mark F. Boyd October 2-3, 1917.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer State Board of Health at request of Mayor Hansen and Health Officer Dr. Sugg.

Reason—To investigate several cases of typhoid.

History—Typhoid is not a reportable disease in Clinton. Since 1910 the typhoid D. R. has ranged from 1.5 to 2.7 per 10,000. The maximum incidence has apparently been in September. During September the health officer learned of the existence of the following 13 cases, all of which were hospitalized:

No.	Age	Sex	Ward	Occupation	Illness Began
1	23	F	I	Housewife	September 25
2	47	F	II	Housemaid	September 21
3	26	M	IV	Electrician	September 15
4	26	F	II	Stenographer	September 12
5	23	F	II	Housewife	September 13
6	40	F	I	Housewife	September 20
7	16	F	V	Student	September 4
8	13	M	V	School boy	September 8
9	18	F	V	Clerk	September 17
10	50	M	V	Factory supt.	September 19
11	13	M	V	School boy	September 6
12	18	M	VII	Machinist	September 21
13	39	F	I	Housewife	September 16

Epidemiologist investigated all the cases. The Vth Ward cases (7-8-9-10-11) are among a group who spent vacation on Rock Creek and apparently contracted infection there. The cases in the Ist and IInd wards are all in adult women. Consideration of transmission of the disease through water, milk, dairy products, other foods, meals away from home, out of town trips, etc., does not reveal anything in common. The grouping of the Ist and IInd ward cases suggests that these women have received infection through the agencies of flies, contaminated with typhoid feces in some privy in the second ward.

Recommendations: (1) The adoption of a morbidity reporting ordinance.

(2) Abatement of privies where sewer connections are possible.

(3) Hospitalization of typhoid cases and distribution of a circular of directions to homes where cases are not hospitalized.

(4) Disinfection and oiling of privy vaults which have received typhoid excrement.

(5) Vaccination of typhoid contacts.

(6) Protecting food in retail establishments from flies.

(7) Sealing the river intake valve at the water pumping station and providing a chlorinating plant as an additional safeguard to supplement the filters in case this intake is used.

INVESTIGATION NO. 24 SUMMARY

Typhoid fever in Mt. Vernon, Linn county, Iowa. By Dr. Mark F. Boyd, October 14, 1917.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer State Board of Health, at request of the mayor of Mt. Vernon.

Reason—To determine source of infection of several cases of typhoid fever.

History—Until summer and fall of 1917, Mt. Vernon has been free from typhoid since 1916.

Epidemiologist by inquiring of physicians learned of the following cases:

KNOWN CASES

No.	Age	Sex	Occupation	Residence	First Ill
1	22	F	Housewife	Mt. Vernon	Sept. 16
2	22	M	Merchant	Mt. Vernon	Sept. 25
4	45	M‡	Veterinarian, farmer, dairyman	Country	Sept. 27
5	21	F	At home	Mt. Vernon	Sept. 22
7	19	F*	School girl	Mt. Vernon	Sept. 29
8	11	F*	School girl	Mt. Vernon	Oct. 3
9	15	F§	School girl	Mt. Vernon	Sept. 13
10	12	F§	School girl	Mt. Vernon	Sept. 14
11	14	F§	School girl	Mt. Vernon	Sept. 21
12	37	M	Laborer	Mt. Vernon	Sept. 17

SUSPECTED CASES

3	35	M	Laborer	Mt. Vernon	Sept. 27
6	16	F	Student	Mt. Vernon	Aug. 12
13	4	F§	At home	Mt. Vernon	Late in July
14	10	M‡	School boy	Country	About Sept. 20

*Sisters.
§Sisters.
‡Father and son.

Cases 1, 2, 5, 7, 8, 12 and 13 had consumed milk retailed by case 4. Case 4 had secured most of his milk from B, in whose family there were three cases of typhoid (9, 10 and 11) one of whom had done the milking up to the time she took sick. Source of infection of these not certain. A previous illness in the same family (13) may have been typhoid. Another case (6) may have occurred in Mt. Vernon at about the same time, which may have some connection with the 3 cases.

Results—Case 4 voluntarily quit the milk business. The health officer stopped B from selling his milk elsewhere. Advised that all the lot patrons of case 4 be kept under observation for a week, since some others might develop the disease and also advised their vaccination.

INVESTIGATION NO. 25.

November 5, 1917.

Mr. E. A. Pace, Mayor, New Market, Iowa.

Dear Sir: On Thursday, November 1st, I went to New Market and personally examined the little boy, Charles Chaney, suspected of being either tuberculous or syphilitic.

As a result of my examination I find no evidence of either congenital or acquired syphilitic infection, or pulmonary tuberculosis. The child apparently has a chronic bronchitis. Speech has been made difficult and impeded by amputation of the soft palate and the presence of an acute coryza or cold and laryngitis further impedes his speech to an extent that it is almost unintelligible. Dr. Kitchen, your health officer, informs me that three consecutive examinations of his sputum for tubercle bacilli have been negative. It therefore does not appear that he can be excluded from school by your Board of Health under Section 1 of Rule 14 of Chapter 2 of the Regulations of the State Board of Health.

It would appear to me that since the child, being an orphan, is not receiving adequate care and attention, and furthermore, that through this neglect he is made an object of regulation to the other pupils attending the same school, the proper solution of your difficulty would be to secure the commitment of this child to either the Industrial School for Boys at Eldora or the Iowa State Orphans Home at Davenport.

Very truly yours,

MARK F. BOYD,
Epidemiologist, Iowa State Board of Health.

INVESTIGATION NO. 26

Mr. D. H. Thomas & Members Board of Health of Forest City Township, Lime Sprihgs, Iowa.

Gentlemen: In accordance with your recent request to Dr. G. H. Sumner, Secretary-Executive Officer of the State Board of Health, for assistance in controlling diphtheria in your township, I was instructed to proceed to Lime Springs and render such assistance as might appear necessary for this purpose.

Previous to December of last year diphtheria had been rarely encountered in your vicinity, but during the winter and spring of 1916-17 several rural cases with several deaths occurred in and around Lime Springs. The source of its importation was not ascertained. The majority of the cases appeared in the school district just west of Lime Springs. For several months the disease was not encountered, but in the middle of August of this year a rural case appeared in the adjoining township of Howard Center. From members of this family it appears that three persons residing in Forest City township became infected. These secondary cases appeared late in September and early in October, were promptly recognized and quarantined, with the result that no further cases have arisen traceable to them.

Some degree of uneasiness has been caused by the fact that individuals from two families living in the school district previously mentioned, and which was the seat of the outbreak of the previous winter, have been attacked by diphtheria this fall, and a repetition of last winter's experience was not desired.

Measures for the control of any disease to be effective must be based on a knowledge of the routes by which such a disease is transmitted. Accordingly brief discussion of the routes by which diphtheria is transmitted is not out of order.

Diphtheria is the result of infection with the diphtheria bacillus, which usually becomes lodged in the throat, nose or larynx, and there produces its specific toxin, which, absorbed into the body, produces the constitutional symptoms of the disease. The organisms usually remain localized to these sites, where the local action of the toxin produces the membrane formation on the mucous surfaces which is characteristic of the disease. The presence of the organism in the nose, throat or larynx may or may not result in the production of the disease. If the person so invaded possesses natural diphtheria antitoxin in the blood, the invasion will not result in disease, though such a person is capable of transmitting the

organisms to others. A lessened degree of immunity will result in the production of a simple inflammation of the throat so mild as to escape recognition as diphtheria unless cultures are taken. Infection with the diphtheria bacillus is always received from a person harboring these organisms, and who may be either a person ill with the disease or a so-called healthy carrier, in whose nose or throat the organisms persist without producing illness. The carrier may be a person who will later develop the disease, or one who has recovered from it but who still harbors the organisms, or even a person who, during the entire time diphtheria bacilli are present, will never, because of their natural immunity, present symptoms of diphtheria. From these cases and carriers the diphtheria bacilli may be transferred to healthy susceptible persons by direct contact, by indirect contact (such as articles recently used by infected persons) or by dairy products that have been infected by such persons. The persons in whom the presence of diphtheria bacillus causes illness usually come under the care of a physician and are then placed under proper supervision and control. But the carriers, because they do not feel ill and present no symptoms of disease, usually escape recognition unless cultures are taken from the nose and throat. The diphtheria bacilli leave the infected persons in the secretions of the nose and throat. Through the inhalation of infected droplets of sputum, kissing the transference of infected fingers to the mouth, healthy persons become infected by direct contact. Infected persons may also place various objects, such as cups, pencils, etc., in their own mouths and thus contaminate them with infective saliva, which objects are in turn later placed in the mouths of healthy persons; we speak of this as the transfer of infections by indirect contact. The diphtheria bacillus, so far as is known, is not capable of sustained existence or multiplication outside the human or animal body, except in milk. The presence of a case of diphtheria is therefore evidence of the existence of an infected individual from whom infection was received. In undertaking to control diphtheria in a community, two essential conditions must therefore be observed:

(1) All persons, (cases and carriers) who are harboring diphtheria bacilli must be detected and placed under proper supervision and control and not permitted to come in contact with healthy persons while infected, i. e. quarantined. (2) The discharges from the nose and throat of such persons, which contain diphtheria bacilli, must be thoroughly disinfected.

In order to secure these results it is necessary that your Board require all physicians to *promptly* report to the Township Clerk all cases or carriers of diphtheria detected by them, in order that isolation and quarantine be promptly instituted.

Children are most susceptible to diphtheria, and in addition, opportunities for the transfer of infection by direct as well as indirect contact are greater in childhood than they are in adult life. Because of this the greatest number of cases occur among children and when adults become infected, infection has generally been received from a child. From these considerations, it becomes necessary to undertake the initial search for carriers among children where the exchange of infection usually occurs, that is, at school, by taking cultures from the nose and throat of all pupils.

Further culture taking should be carried on among the family and immediate associates of any case or carrier discovered in the initial search. All carriers found should be quarantined until two consecutive negative cultures have been obtained from the nose and throat of each infected person, taken not less than 24 hours apart. The simultaneous obtainance of one negative culture from all other persons living in contact with the case or carrier in the quarantined house, is also required. In all instances the culture method of releasing quarantine should be followed.

Since elsewhere in the township aside from the single school district, the disease seems to be under control, the situation indicates that within this school district there exists one or more unrecognized infected persons who were propagating and disseminating diphtheria bacilli. Infected children have undoubtedly been the chief dissemination, infecting others during their association at school, while these in turn would bring the germs home and infect older and younger members of their own families. Great necessity therefore existed for the culturing of all individuals of all families residing therein who have members attending school. It also appeared advisable to reculture the members of the family living in Howard Center township, to be certain that none of these individuals were still infective.

Accordingly all members of these 6 families were cultured, a total of 31 being secured. Instructions were left for three individuals who were not at home at the time of my visit to report to your health officer for culturing. Cultures from four individuals were found to contain diphtheria bacilli. Two of these were members of a family which had diphtheria earlier this fall, the other two were in families which to date this fall had escaped illness from the disease. The family in Howard Center were at present found to be free from infection.

The carriers should be controlled according to Chapter II, Rule II. Section 4 of the regulations of the State Board of Health, copies of which have been forwarded to your health officer, and are found on page 6 of the published regulations. If carefully administered I consider that further trouble will not be experienced, but if other cases should arise in households at present free from infection, the same methods employed should be repeated.

I wish to express my appreciation of the courtesy and assistance of Mr. Thomas and Dr. Laraway.

Respectfully submitted,

MARK F. BOYD,

Epidemiologist, Iowa State Board of Health.

Approved, Henry Albert, Director.

Iowa City, Iowa, November 24, 1917.

INVESTIGATION NO. 27 SUMMARY

Diphtheria in Webster City, Hamilton County, Iowa. By Drs. Mark F. Boyd and C. B. McGlumphy, November 26, 1917.

By order from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health.

Reason—To discover source of epidemic of diphtheria.

History—Cases of diphtheria occurred during 1917 and present outbreak began in November, 1917.

Epidemiologist investigated cases occurring during November for purpose of obtaining information which might lead to the discovery of a common source of infection. Cultured 227 school children and directed exclusion of absentees until cultures taken and reported. Made the recommendations, as given in the general report, for the control of the epidemic.

Result—The number of cases has gradually declined and at present the epidemic has apparently been brought under control.

INVESTIGATION NO. 28 SUMMARY

Typhoid Fever, Iowa City, Johnson County, Iowa. By Dr. C. B. McGlumphy, January.

By order from Dr. Albert on request by Dr. Rohrbacher, City Health Officer of Iowa City, Iowa.

Epidemiologist informed of two cases of typhoid being treated in local hospitals, and during investigation three more cases were reported from University Hospital. Three other cases were found to have occurred during the last eight weeks. All the above cases were investigated for the purposes of determining the source of infection.

No.	Age	Sex	Occupation	To Bed	Water	Milk
1	40	F	Nurse	Nov. 17	City	Dairyman X
2	22	M	Student S. U. I.	Dec. 12	City	Dairyman X
3	25	M	Student S. U. I.	Jan. 12	City	Dairyman X
4	21	M	Student S. U. I.	Jan. 8	City	Dairyman X
5	22	F	Student S. U. I.	Dec. 12	City	Dairyman X
6	9	M	Student pub. school	Dec. 15	City	Pasteurized
7	17	M	Student high school	Dec. 15	City	Dairyman X
8	39	F	Nurse	Jan. 6	City	Dairyman Z

Conclusion—Cases No. 1, 2, 3, 4, 5 were quite certainly infected through milk contaminated by a carrier of typhoid bacilli. Case No. 8 was quite certainly infected by direct contact. No source of infection could be found to account for cases 6 and 7.

Recommendations—1. That a bacteriological examination be made of the urine and feces of dairyman X and wife. (First examination was negative.)

2. That dairyman X be ordered to cease supplying customers with raw milk, but be permitted to sell milk to a creamery which pasteurizes milk before churning. This arrangement went into effect December 20, 1917.

3. That dairyman X dispose of his cows and engage in some other business.

INVESTIGATION NO. 29 SUMMARY

Smallpox at Osage, Mitchell County, Iowa, by Dr. John H. Hamilton, February 19, 1918.

By order transmitted by Dr. Albert from Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health.

History—Twelve cases of skin eruption have developed recently. Some of these had been reported as smallpox by some of the local physicians, while others had been reported as chicken pox by one of the local physicians.

Epidemiologist found six saces other at the time of the investigation.

Conclusions—That all the cases seen by the epidemiologist were cases of smallpox.

Recommendations—That the rules and regulations of the Iowa State Board of Health in reference to reporting, quarantining, isolation of non-immune contacts and disinfection should be rigidly enforced. (Rules and Regulations of the State Board of Health (Vol. 2, No. 2, 1917) Chapter 1, Rule 3 of Chapter 2, Chapter 3.

INVESTIGATION NO. 30 SUMMARY

German measles, Soldiers' Orphan's Home, Davenport, by Dr. John H. Hamilton, February 21, 1918.

By order transmitted by Dr. Albert from Dr. G. H. Sumner, Sec Exec. Officer, State Board of Health, upon request of Mr. Mahannah.

History—Informed of 64 cases of skin rash, some of which have been reported as scarlet fever by the attending physician.

Epidemiologist investigated the epidemic and examined several patients.

Conclusions—That all the cases occurring in this epidemic are German measles.

Recommendations—Early diagnosis of cases. Isolation of cases and suspected cases. Establishment of detention room for new arrivals.

Examination of new children for diphtheria and typhoid bacilli. Medical examination of new employees.

INVESTIGATION NO. 31 SUMMARY

Scarlet fever, Bondurant, Polk County, Iowa, by Dr. John H. Hamilton, March 3, 1918.

By order of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, upon request of Mayor F. L. Johnson.

History—Informed of fourteen cases of skin rash which had been diagnosed as scarlet fever by attending physicians.

Epidemiologist investigated the epidemic. Saw a member of patients and confirmed the diagnosis of scarlet fever. Made a house-to-house canvass in an effort to find new or unrecognized cases of the disease.

Conclusions—That all cases occurring in this epidemic were scarlet fever.

Recommendations—(1) That the sections relative to scarlet fever of the Rules and Regulations of the State Board of Health be published in pamphlet form and distributed to the heads of families in order that all may be thoroughly familiar with the procedures necessary to control the epidemic.

(2) That the procedure which the local board of health inaugurated be continued.

(3) That the Rules and Regulations of the State Board of Health be rigidly enforced.

(4) That parents, teachers, and physicians be on the alert for new or unrecognized cases.

(5) That all suspected cases be treated as cases of scarlet fever until a definite diagnosis can be made.

(6) That the sale of foods, particularly milk be prohibited from homes in which cases of scarlet fever exist.

INVESTIGATION NO. 32 SUMMARY

Smallpox at Tama, Tama county, Iowa, by Dr. John H. Hamilton, March 8, 1918.

By order of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, upon the request of Mayor P. Hixson.

History—Twelve cases of skin eruption developed since January 1st. Some of these have been reported as smallpox, some as chickenpox and some have not been reported at all.

Epidemiologist investigated the situation, saw five cases which had been reported as smallpox and conferred with the local board.

Conclusions—That all the cases seen by the epidemiologist were cases of smallpox.

Recommendations—1. That the rules and regulations of the State Board of Health relative to smallpox be published in pamphlet form and distributed to the heads of families or that they be posted in conspicuous places where the heads of families can see them.

2. That the physicians as well as citizens of your city be informed that you expect to enforce these rules and regulations strictly.

3. That the citizens be encouraged to be immunized against smallpox by vaccination.

INVESTIGATION NO. 33 SUMMARY

Typhoid fever at Corydon, Wayne county, Iowa, by Dr. John H. Hamilton, March 11-12, 1918.

By order of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, upon request of the Hon. A. T. Gallagher, City Clerk.

History—Eleven cases of typhoid fever developed since February 1st.

Epidemiologist investigated the situation and conferred with the local board of health.

Conclusions—That all of the cases seen by the epidemiologist were typhoid fever.

Recommendations—1. That all sections of the Rules and Regulations of the State Board of Health which refer to the control of typhoid fever be rigidly enforced.

2. That the convalescent patients continue to disinfect and properly dispose of their excrement throughout the coming summer.

3. That the patient should be advised to wash his hands very carefully before handling foods of any sort.

4. That no night soil should be used to fertilize ground on which vegetables are grown.

5. That a suitable cover be constructed for the underground reservoir of the city water supply.

6. That the effluent from the septic tank be treated in some manner which will destroy the pathogenic bacteria contained therein.

7. That the householders of the community be urged to connect with the city sewer.

8. That those who cannot connect with the city sewer be urged to construct privies of a sanitary type.

9. That all garbage, manure and other refuse which would attract flies be carefully disposed of.

10. That all new cases of typhoid fever be reported promptly and an effort made to ascertain the source of the infective agent.

11. That all persons who come in immediate contact with cases or convalescent cases be urged to be vaccinated with typhoid vaccine.

INVESTIGATION NO. 34 SUMMARY

Typhoid fever at Dubuque, Dubuque county, Iowa, by Dr. John H. Hamilton, March 18-21, 1918.

By order of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, upon request of the Hon. James Saul, Mayor.

History—About thirty cases of typhoid fever have developed since December 15th.

Epidemiologist investigated the situation and conferred with the local board of health.

Conclusions—That the epidemic is one of typhoid fever and that the infectious agent was conveyed by the city water.

Recommendations—1. I wish to endorse the recommendations which Mr. Jack J. Hinman, water bacteriologist and chemist of the State Board of Health made in his report on March 25th.

2. That all sections of the rules and regulations of the State Board of Health which refer to the control of typhoid fever be rigidly enforced.

3. That the convalescent patients continue to disinfect and properly dispose of their excrement throughout the coming summer.

4. That the patient should be advised to wash his hands very carefully before handling foods of any sort.

5. That no night soil be used to fertilize ground on which vegetables are grown.

6. That the householders of the community be urged to connect with the city sewer.

7. That those who cannot connect with the city sewer be urged to construct privies of a sanitary type.

8. That all garbage, manure and other refuse which would attract flies be carefully disposed of.

9. That all new cases of typhoid fever be reported promptly and an effort made to ascertain the source of the infective agent.

10. That all persons who come in immediate contact with cases or convalescent cases be urged to be vaccinated with typhoid vaccine

INVESTIGATION NO. 35 SUMMARY

Scarlet fever at Livermore, Humboldt county, Iowa, by Dr. John H. Hamilton, April 18, 1918.

By order of Dr. G. H. Sumner, Sec.-Exec. Officer, State Board of Health, upon request of the mayor of Livermore.

History—For the past month there have been a number of cases of eruptive fever.

Epidemiologist investigated the situation and conferred with the local board of health.

Conclusions—That there were a number of cases of German measles about four weeks ago. There are at present three known cases and one suspected case of scarlet fever.

Recommendations—1. That the rules and regulations of the State Board of Health relative to scarlet fever be published in pamphlet form and distributed to the heads of families in order that all may have an opportunity to know exactly what the State Board of Health requires and recommends.

2. That these rules and regulations be strictly enforced.

3. That the schools should be opened not later than April 25th, provided there are no new cases of scarlet fever in the community.

4. That parents, teachers and physicians be on the alert for new or unrecognized cases.

5. That all suspected cases be treated as cases of scarlet fever until a definite diagnosis can be made.

6. That the sale of foods, particularly milk be prohibited from homes in which cases of scarlet fever exists.

TABLE I.

SUMMARY OF THE WORK OF THE BIENNIUM
A. CENTRAL LABORATORY, IOWA CITY

	1916-17	1917-18	Summation	Total
I—Diagnostic Division—				
a. Outfits distributed	18,278	20,030		
b. Specimens received—				
Diphtheria	9,028	8,353	17,383	
Typhoid	1,995	1,528	3,523	
Paratyphoid		3	3	
Tuberculosis	3,355	3,017	6,372	
Rabies	37	23	60	
Meningitis	473	13	486	
Gonorrhea	103	28	126	
Miscellaneous	87	163	250	
Total	15,079	13,279	Summation	28,314
II—Immunization Division—				
Anti-rabic inject.	300	775	1,075	
Anti-typh. inject.	693	496	1,191	
Anti-smallpox inoc.	78	329	405	
Total	871	1,800	Summation	2,671

SUMMARY OF THE WORK OF THE BIENNIUM—Continued

	1916-17	1917-18	Summation	Total
III—Water Analysis Division—				
Water	1,950	1,850	3,800	
Ice	19	5	24	
Sewage	43	100	143	
Total	2,012	1,955	Summation	3,967
IV—Epidemiology Division—				
Field investigations	18	18	36	
V—Branch Laboratories—	18	18	Summation	36
1. Diagnostic—				
Diphtheria				
Typhoid	1,705	2,239	3,944	
Tuberculosis	246	185	431	
Miscellaneous	473	320	793	
	3,392	3,332	6,724	
Total	5,816	6,076	Summation	11,892
Grand total	22,702	23,139		46,880

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	8,423	2nd	17,289
4	July 1, 1907—June 30, 1908	8,809		
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		
13	July 1, 1916—June 30, 1917	23,752	7th	46,880
14	July 1, 1917—June 30, 1918	23,128		

RECOMMENDATIONS

It is very desirable to extend the work of the Laboratories as follows:

1. To provide for continuing the making of Wassermann examinations which was started by aid from the Federal Public Health Service and also to extend such work so as to make it available for all citizens of the State without charge.

2. To provide for the bacteriological examination of feces and urine on a larger scale so as to differentiate more clearly between typhoid and paratyphoid fever and to discover carriers of these organisms before they have an opportunity to spread these diseases in epidemic form.

3. To provide for an increase in the number of diagnosis outfits, to meet the increase in the cost of supplies of all kinds, to hire additional assistants, and to increase salaries sufficiently to enable the laboratory to retain good employees.

In order to make provision for these things, I recommend the forthcoming legislature be asked to increase the annual appropriation for the laboratory by $6,000.00.

I also recommend that the legislature be asked to make such appropriation available as soon as possible after it is passed since otherwise it may not be possible because of the expense of laboratory animals to continue to make Wassermann examinations even though the Federal Public Health Service provides a serologist to do the work.

INDEX