THE EXPERIENCE OF THE STATE OF ILLINOIS WITH THE SHALLOW WELL.

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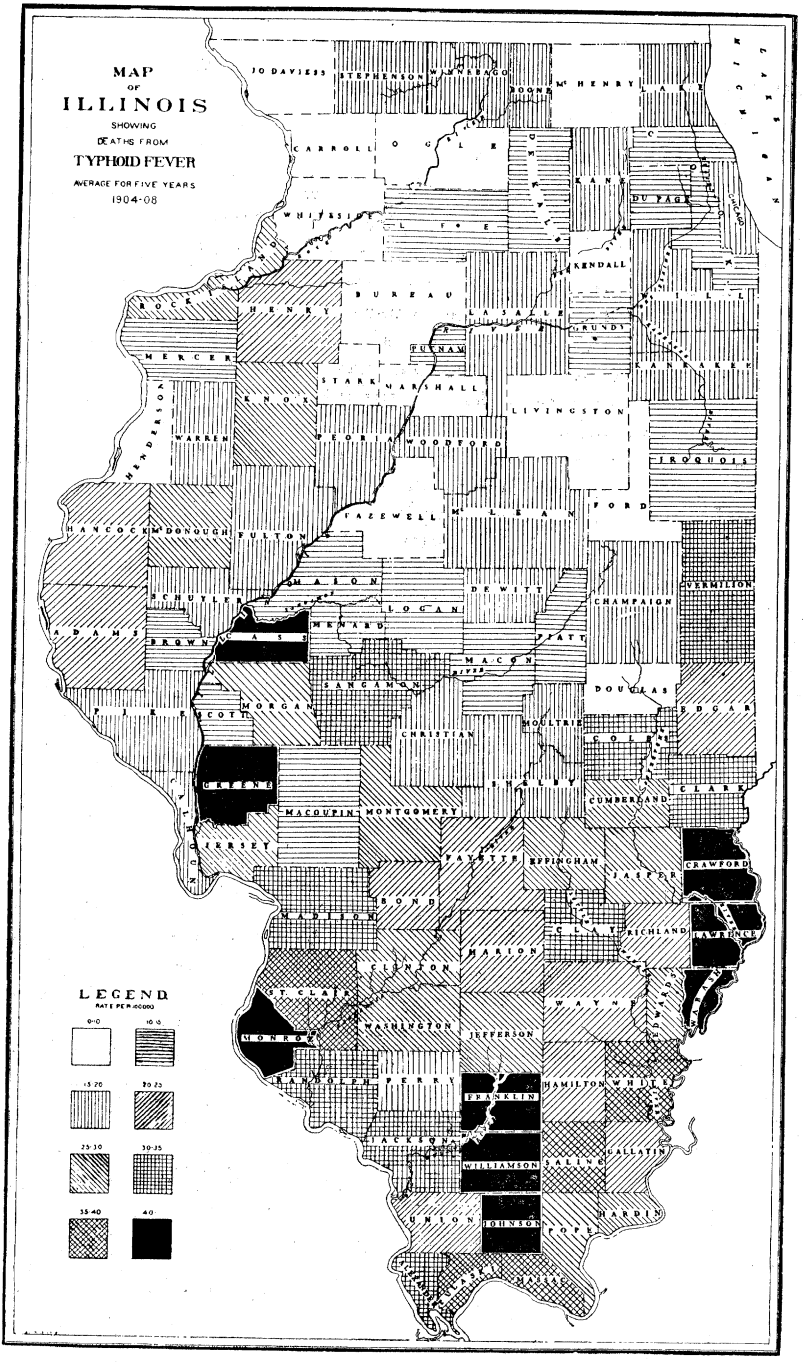
Very few Illinois cities obtain their municipal water supplies from shallow wells. Many people in cities either from necessity or preference use shallow well water for drinking purposes. Oftentimes the city mains are not extended to new sections. Oftentimes in old sections the houses are not connected with the mains, making the use of a shallow well necessary. Oftentimes the city water furnished has unpleasant physical characteristics like taste, color, or turbidity causing people to prefer the clean shallow well water.

In a great measure the relative use of shallow wells in different sections of the state is dependent upon the source and character of the municipal water supplies. In the northern part of the State of Illinois, the majority of the city water supplies are obtained from deep rock wells. In the east central portion of the state the water supplies are obtained from deep drift wells, in the west central and southern part of the state from streams. It is possible to have deep rock wells in the northern part of the state because the St. Peter and Potsdam sandstones which outcrop in the central and northern part of Wisconsin dip to the southward so that they are from a few hundred feet to two thousand feet below the surface in the northern third of Illinois, or rather north of a line drawn from Quincy to Chicago. Because the height above sea level in Illinois is less than in Wisconsin, wells which enter these two strata are free flowing or can be easily pumped. Such wells furnish an ideal water for municipal water supply. As the water lies in the water bearing stratum it is absolutely free from contamination. Proper measures must be taken to prevent contamination during delivery to the consumer from defective casing, from contaminated reservoirs, or from faulty connections with river supplies.

In deep rock wells along or south of a line drawn from Quincy to Chicago there is a strong probability that the water will be very highly mineralized. It is therefore necessary in the central and southern parts of the state to obtain water supplies from sources other than deep wells in rock. In the eastern part of the central area the glacial drift is deep enough and contains gravel coarse enough to furnish a satisfactory


MAP
OF
ILLINOIS
SHOWING
DEATHS FROM
TYPHOID FEVER
AVERAGE FOR FIVE YEARS
1904-08
LEGEND
RATE PER 100,000
0-0
10-15
15-20
20-25
25-30
30-35
35-40
40
JO DAVIESS
STEPHENSON
WINNEBAGO
BOONE
McHENRY
LAKE
CARROLL
OGLE
DE KALB
KANE
DU PAGE
WHITESIDE
LEE
KENDALL
ROCK ISLAND
HENRY
BUREAU
LA SALLE
GRUNDY
KANKAKEE
MERCER
PUTNAM
STARK
MARSHALL
LIVINGSTON
ROCK
WARREN
PEORIA
WOODFORD
IROQUOIS
HENDERSON
FORD
FULTON
TAZEWELL
McLEAN
HANCOCK
McDONOUGH
SCHUYLER
MARION
DE WITT
CHAMPAIGN
VERMILION
ADAMS
BROWN
CASS
MENARD
LOGAN
PIATT
MACON
SANGAMON
DOUGLAS
EDGAR
PIKE
SCOTT
MORGAN
CHRISTIAN
MOULTRIE
COLES
GREENE
SHELBY
CUMBERLAND
CLARK
MACOUPIN
MONTGOMERY
JERSEY
EFFINGHAM
JASPER
CRAWFORD
MADISON
RICHLAND
LAWRENCE
CLINTON
WAYNE
ST. CLAIR
WASHINGTON
JEFFERSON
MONROE
RANDOLPH
PERRY
FRANKLIN
HAMILTON
WHITE
JACKSON
WILLIAMSON
SALINE
GALLATIN
UNION
JOHNSON
POPE
HARDIN

water bearing stratum. We therefore find many of the cities in this area obtaining their water supplies from wells from 100 to 200 feet in depth. These waters are also prefectly free from contamination in the water bearing strata and if properly cared for, furnish a perfectly hygienic supply.

In the western part of this area and to the south of a line drawn from St. Louis to Danville, the drift is not deep enough to furnish sufficient reservoir capacity and it is necessary to rely on surface waters for municipal supplies. Very few of the surface water supplies in this section of the state have been filtered. The unfiltered water supplies are not only unattractive for drinking but they may be contaminated or even infected. With unattractive municipal supplies the citizens in this section use water from shallow wells which may be impure.

Under such conditions we expect a higher typhoid fever death rate in the southern part of the state than in the east central and northern parts.

A study of the statistics collected by the State Board of Health from 1904 to 1911 (*) shows this to be the case. Dividing the state into two parts, (see map) 51 counties to the north and the same number to the south, we find in the northern part of the state but two counties with a rate exceeding 30 per 100,000 and not one county with a typhoid fever death rate of 40 per 100,000. Sixteen of these northern counties had a rate of below 10 per 100,000.

In the southern part of the state there were five counties with a typhoid fever rate of more than 40 per 100,000 and 12 more with a typhoid fever death rate of more than 30, and but one with a rate below 10 per 100,000. It is gratifying to note that the average for the eight years, 1904-11 is better than the average for the five years 1904-8.

Another reason for typhoid fever in the southern part of the state is the fact that 32 per cent of the towns of more than 1,000 inhabitants have no water supply, whereas in the northern part only 10 per cent are without a water supply. Shallow wells are of course used where there are no municipal water supplies and it is certain that the use of shallow well water is influential in spreading typhoid fever.

We have carefully classified all well waters sent to the Survey for examination during the years 1907-12. The waters received have been classified according to depth as follows: Less than 25 feet, 25 to 50 feet, 50 to 100 feet, over 100 feet, and unknown. The variation in the quality of each class from year to year is but slight as indicated on the diagram. The

*Proceedings Illinois Water Supply Association. 2, 151-164.

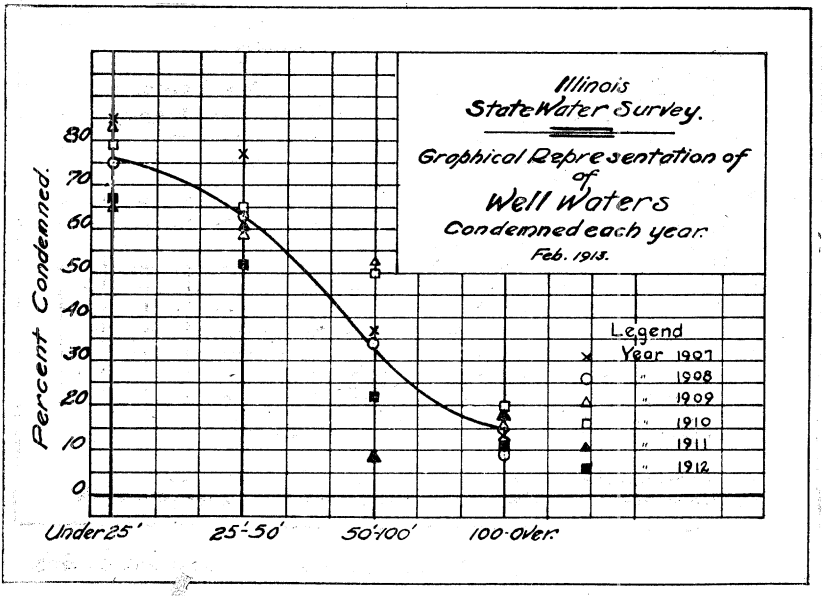
Purity of Well Waters.

Showing Percentage of Well Water Condemned Annually by the Water Survey. Arranged According to Depth of Well.

	1907	1908	1909	1910	1911	1912	Total
Less than Twenty-five ft.—							
No. Examined	284	254	242	148	113	168	1209
No. Condemned	240	192	183	118	74	113	920
Per Cent Condemned	85	75	75	79	65	67	76
Twenty-five to Fifty ft.—							
No. Examined	224	395	354	201	196	353	1723
No. Condemned	173	250	226	137	122	185	1093
Per Cent Condemned	77	63	63	65	62	52	63
Fifty to One Hundred ft.—							
No. Examined	111	192	161	90	89	129	772
No. Condemned	42	66	54	46	8	28	244
Per Cent Condemned	37	34	53	51	9	22	32
Over One Hundred ft.—							
No. Examined	161	312	376	205	171	339	1564
No. Condemned	22	31	62	43	30	49	237
Per Cent Condemned	13	9	16	20	17	14	15
Unknown Depth—							
No. Examined	88	46	72	67	19	27	319
No. Condemned	34	22	38	35	9	6	144
Per Cent Condemned	38	47	52	52	47	22	45
Total No. Examined	868	1199	1205	711	588	1016	5587
Total No. Condemned	511	561	563	379	243	381	2638
Per Cent Condemned	60	46	47	53	41	38	47

average number condemned decreases with the depth of the well. Of those less than 25 feet in depth 76 per cent were condemned, of those 25 to 50 feet, 63 per cent were condemned, of those 50 feet to 100 feet, 32 per cent were condemned, of those 100 feet in depth only 15 per cent were condemned and many of the deepest were condemned because of excess of mineral content and not because of contamination. Of those of unknown origin 45 per cent were condemned. Of all the well waters received during the six years, 47 per cent were condemned. It is gratifying to note a decrease in typhoid fever during the latter part of the period.

Without doubt the above does not give the true idea of the actual condition of the water obtained from wells throughout the state. As a matter of fact a majority of samples sent to the Water Survey for examination is sent because of typhoid fever among those using the water. A truer estimate



of the actual character of the waters of the state can be obtained from a study of waters collected by representatives of the Survey from typical farm wells. The number of samples examined is comparatively small. While 73 per cent of

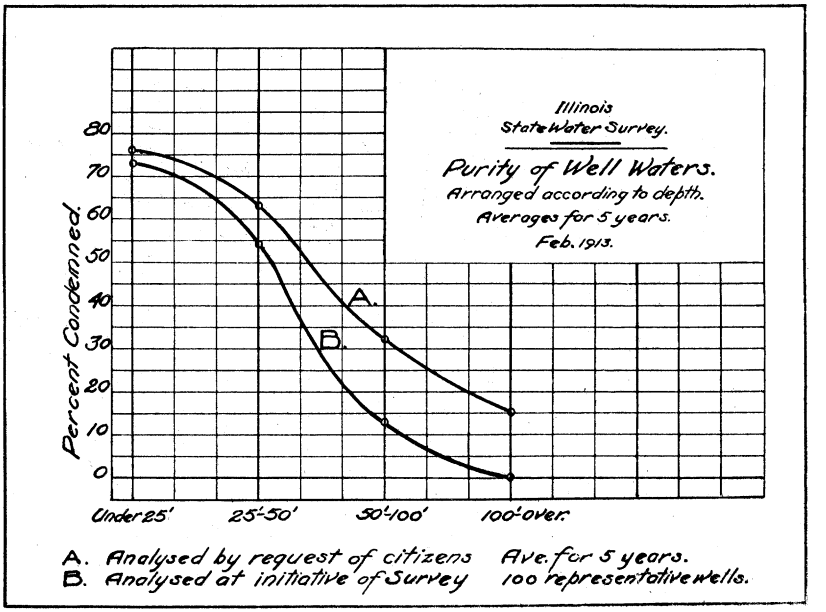
Farm Wells.

Samples Collected by the Survey and Should Represent Average Conditions.

	Less than 25 ft. deep.	25 ft. to 50 ft.	50 ft. to 100 ft.	More than 100 ft.	Total
No. Examined	15	41	15	29	100
No. Condemned	11	22	2	0	35
Per Cent Condemned	73	54	13	0	35

those less than 25 feet deep were condemned, only 54 per cent of those from 25 to 50, 13 per cent of those from 50 to 100 feet, and none of those over 100 feet in depth were condemned. The diagram shows the relation between the character of samples analyzed by request of citizens and of those analyzed on the initiative of the Water Survey. Those collected by the survey are of better quality.

The results of the examination of the water from shallow wells showed three-fourths of them to be contaminated and possibly dangerous. An ideal remedy would be to abolish



all shallow dug wells but the ideal cannot be obtained in this as in many other matters.

As indicated in the discussion of the sources of municipal water supplies in the state, it is impossible in some parts of the state to obtain a satisfactory water from deep wells so that the shallow well is a necessity. Whenever the water bearing stratum is porous enough to allow free flow, a driven or bored well less than 50 feet deep should furnish satisfactory water. In many cases however the flow through the water bearing stratum is so small that it is necessary to make a reservoir into which the water may slowly percolate and from which it can be drawn as needed. Hence the shallow dug well is a necessity. Granting that it is a necessity, great care must be taken to protect the water. The character of the strata which it penetrates must be taken into consideration. Strata of sand may serve as a filter and purify the water. Strata of clay or other material through which water may flow in crevices or cracks may allow pollution to be carried a considerable distance. Wells should be located on a higher level than cesspools, privies or barnyards and these must be built at a distance from the well. The immediate surroundings of the well must be carefully protected. A surface water should not be allowed to pass through the casing within at least four feet from the top. The cover should be tight so that water from the pump may not flow

back into the well carrying with it the dirt and filth from the well cover.

If typhoid fever does break out we wish to emphasize the fact that about the last thing to do is to send water for examination. Typhoid fever infection has taken place from 10 days to two weeks before the symptoms are recognized. There are other sources of typhoid fever and even if the water were the cause, during the time between infection and the outbreak of the disease the water in the well may have lost its infection. Rather should the patient be cared for that he may not again infect the well or infect others by contact. The water may be analyzed but it will require from one week to ten days to obtain the results of an analysis and in the meantime infection may have spread through other means. It is the wisest course to protect the well so that infection cannot enter, making the water safe at all times.

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