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American Public Health Association

A

SANITARY SURVEY OF ST. LOUIS:

BEING A SERIES OF SHORT PAPERS ON LEADING PUBLIC HEALTH TOPICS CONTRIBUTED BY CITY OFFICIALS AND LOCAL SANITARIANS.

WITH AN APPENDIX.

EDITED BY GEORGE HOMAN, M. D.

REPRINTED FROM THE TRANSACTIONS OF THE AMERICAN PUBLIC HEALTH ASSOCIATION, VOL. X, FOR THE ST. LOUIS LOCAL COMMITTEE.

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NOTE. Dr. J. P. Kingsley, Professor of Physiology and Diseases of Children in the Missouri Medical College, was unfortunately unable to complete the promised paper for the local series on "The Infant and School Populations, and existing Causes unfavorable to their Health," the absence of which from the collection is much to be regretted.—ED.

CONTRIBUTORS.

JOHN D. STEVENSON, Esq.
THOMAS J. WHITMAN, C. E.
JOSEPH SPIEGELHALTER, M. D.
GEO. HOMAN, M. D.
Prof. F. E. NIPHER.
ROBERT MOORE, C. E.
J. W. TURNER, C. E.
ROB'T LUEDEKING, M. D.
FRANK R. FRY, M. D.

CONTENTS.

I. The Situation, Surroundings, and Soil of St. Louis.
II. The Mean Temperature and Climatic Conditions of St. Louis.
III. Organization of Health Department, Sanitary Legislation, etc.
IV. Sewerage and House Drainage in St. Louis, } With Map.
V. The Public Water-Supply of St. Louis, }
VI. Street and Alley Paving in St. Louis.
VII. The Local Milk-Supply: its Sources and Quality.
VIII. The Leading Local Productive Industries, etc.
IX. The Chief Local Factors in the Causation of Disease and Death, with Map.

Notes upon the History of Cholera in St. Louis, with Map and appended Table; also, Tabulated Showing of Localities of all Deaths from Cholera in 1866.

The Manufacture of Soda-Water from Polluted Well-Water.

COMMITTEE OF ARRANGEMENTS

Appointed to prepare for the St. Louis meeting of the American Public Health Association, held October 14–17, 1884.

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I.

THE SITUATION, SURROUNDINGS, AND SOIL OF ST. LOUIS, CONSIDERED FROM A HYGIENIC STAND-POINT.[1]

By GEORGE HOMAN, M. D.

Situated on the west bank of the Mississippi river, and partially embraced in a gentle curve of that stream as it bends toward the the east,—located in a territory whose confines are bordered by the Missouri river on the north and north-west, and remotely by the Meramec river on the south-west, while the area thus included is bisected by the river Des Pères, whose course lies for some distance within the municipal limits,—seated on a series of terraces that rise successively from the river front westward to a height of one hundred and sixty feet at a point about three miles distant from the water's edge, the city of St. Louis may be said to possess altogether commanding natural and primary advantages when viewed from a public health stand-point.

The ridges which form the benches or terraces mentioned, and which follow somewhat closely the general course of the river for some miles in the central front of the city, disappear about midway of the town in a narrow depression lying east and west, known as Mill Creek valley, which was and still is the drain-way for surface waters gathered in the outlying western middle parts of the city.

Near the north end of the town, where the heights are crowned by the two largest cemeteries in the city, a considerable tract of flat land of alluvial formation lies between the foot of the bluffs and the Mississippi, and through this bottom land several small streams find their way to that river. The principal ones, Harlem and Maline creeks, pierce the upland range respectively about four and a quarter and six miles north of the Mill Creek depression, and afford outlet for the surface waters of a considerable area lying in the north and north-western parts of the city and suburbs.

The water-shed of the rearmost portion of the city territory is toward and into the valley of the Des Pères, which stream skirts the western limits and forms the southern boundary of the city at its entrance into the Mississippi at South St. Louis. At this point the bluffs approach closely to the edge of the larger stream, and reach a height of about one hundred

[1] It was the original design to have this topic treated by Henry Flad, C. E., President of the Board of Public Improvements, but circumstances prevented the performance of the task by him as intended.—Ed.

feet. The original surface of the town site was rarely broken abruptly at any point, being usually gently undulating in character; and this remains a feature of the present suburban topography.

The capacity of the site and surroundings of St. Louis for perfect surface drainage may be said to be unsurpassed by any city of nearly equal size wherever situated, and this natural capacity and advantage have been skilfully supplemented and strengthened by artificial means.

The country adjacent to St. Louis on the west, presenting as it does a succession of swells and vales whose water-ways all tend southward, is largely devoted to market gardens and farms, while growths of hard-wood timber frequently appear on hillsides and along water-courses. The healthfulness of this region, reaching on the one hand to the Meramec river and on the other to the Missouri river, is undoubted, while the soil is fertile in cereals and fruits, and richly rewards efficient cultivation.

Opposite the front of the city, in Illinois, lies the well known American bottom, an alluvial plain some seven miles in its greatest breadth, and many miles long, now quite extensively cultivated; and while still subject in part to overflow during high water,—which usually occurs in the spring and early summer seasons,—has somewhat outlived its former notorious reputation for malarial unwholesomeness. But whatever ill effects the damps and miasms from this low ground exerted in earlier times upon the public health of St. Louis, they have long since ceased to be felt in the slightest degree.

There seems little reason to doubt that the river has at all times exercised a protective or screening influence upon the west bank in this respect; and the infrequency of local east winds has been a further advantage to the dwellers on this side of the stream.

There are no marshes or stagnant flats and shallows connected with the rivers near St. Louis, that are close enough to have any influence for evil on the health of her people. As before stated, her superficies as well as her surroundings are exceptional in this respect; while the character and quality of the soil upon which her foundations rest in no wise detract from her inherent hygienic integrity.

The blue-grass which appears here spontaneously and luxuriantly testifies to the good quality of the humus and mold which everywhere overlies a bed of usually dry, sound, compact yellow clay, which varies in thickness from ten to thirty feet. When incorporated with water, this substance is tough and sticky, making a brick of unusual excellence; but the contour and water-shed of city and suburbs are such that no plateaus or levels of any considerable extent appear where injury results from wetness of soil, or from standing water due to resistance to percolation of the underlying clay. Along the river front, and for some distance back, the clay formation rests upon limestone strata of varying thickness, while in the extreme western limits and in St. Louis county coal measures of good quality occur, beneath which are found extensive deposits of fire clay of great commercial value.

A peculiarity of the terrain of St. Louis and vicinity is the numerous

occurrence of circular basins or conical sink-holes ranging in size at the surface from ten to one hundred feet in diameter, and often twenty or thirty feet in depth. Their formation is explained on the supposition that in prehistoric times, when the surface of the land was submerged or was emerging from the flood, and while the clay deposit was still soft or plastic, these pits marked the sites of fissures in the underlying rock through which the waters drained away, the circular form being caused by the action of the water as it passed off through the opening beneath.

While much has been done by the people of St. Louis, through deliberation, inattention, or ignorance, to their own detriment and discomfort in a public-health sense, still such acquired drawbacks do not nearly outweigh the conspicuous advantages already briefly alluded to, and which may be summarized as follows:

1. The generally elevated character of the municipal site.

2. The present dryness and sanitary safety of the soil on which the city rests.

3. The almost perfect system of general drainage provided by both nature and art.

4. The instant removal and speedy destruction of the outpouring wastes and refuse thus collected, by the vast volume of the Mississippi, whose waters, turbid with suspended clay and sand, exert a purifying influence upon foul liquids mingled with them, independent of the effect of oxidation.

5. The soundness and safety, as regards freedom from organic admixture, of the public water-supply.

6. The salubrity of the surrounding country in respect of absence of swamps or marshes, with their accompanying malarial exhalations.

II.

THE MEAN TEMPERATURE AND CLIMATIC CONDITIONS OF ST. LOUIS.

By F. E. NIPHER,

PROFESSOR OF PHYSICS, WASHINGTON UNIVERSITY.

The climate of St. Louis does not differ in any marked way from what might naturally be expected, when we consider its position in the interior of a great continent. We naturally expect greater and more sudden extremes than in the same latitudes near the ocean. The annual temperature of St. Louis is 55.4°, which is about two tenths of a degree above that of Washington, D. C., and about four tenths of a degree below that of San Francisco. The character of a climate is, however, best judged by a study of the law according to which it deviates from average or normal conditions.

It is necessary to determine the frequency of different degrees or amounts of divergence from average or normal conditions. This has not yet been fully accomplished for St. Louis, although, thanks to the zeal of our lately deceased friend, Dr. George Engelmann, the material for such discussion has been collected for a period of forty-eight years.

As regards the frequency of the highest temperatures, a few results suitable for presentation on an occasion like the present may be given. On the average, we have in St. Louis during the summer months,—June, July, and August,—twenty-three days when the daily maximum rises to or above 90°, between six and seven days when it rises to or above 95°, and one day when it rises to or above 100°. It may be a surprise to some to know that these same values are true for the city of Washington. During the last ten years we have had some of our warmest as well as some of our coolest summers. During the summer of 1881, the whole central Mississippi valley was oppressed with unusual drouth, and during the summer the temperature rose to or above 90° on forty-four days of the ninety-two; on twenty-five days the temperature rose to or above 100°, the highest temperature ever recorded in St. Louis—104°—being reached August 9th of that year. This, however, is a very unusual condition.

At present the records of Washington temperatures are not accessible to me for a period greater than seven years, but I find that in the summer of 1873 the temperature at that place rose to or above 90° on thirty-seven days; to above 95° on ten days, and to or above 100° on one day.

Since 1881, during three summers, we have had only thirty-seven days

during the whole three years when the temperature rose above 90°, and at no time has it reached 95°.

The effect of high temperatures upon people of feeble health depends in quite as important a manner upon the number of warm days as upon the excess of temperature above the normal, and for any continuous period of excessive heat the condition of producing a definite effect upon the human system is, that the duration of the heated period varies inversely as some power, possibly the first, of the excess of temperature above the normal.

Temperature, however, is not the only important element in determining the effect of hot weather upon health. Fully as important is the relative humidity, or degree of the saturation of the air with moisture. Of this our St. Louis weather has furnished us at least one most instructive case.

In 1878, from the tenth to the twenty-first of July, we passed through a heated term in which the daily maximum gradually rose from 93° on the tenth, to 97° on the sixteenth and seventeenth, falling as gradually to 92° on the twenty-first. At the same time the number of deaths from solar heat increased from two on the tenth to forty-one on the fifteenth, diminishing again to seven on the twentieth and zero on the twenty-first. The total number of deaths from solar heat during these ten days was 154.

In August, 1881, after an usually oppressive July, in which the average maximum was 92° and the highest 100°, a temperature of 95° or over being reached nine times during the month, we entered upon the hottest period ever observed in St. Louis. From the first to the sixth the daily maximum gradually rose from 92° to 97°, dropping to 89° on the seventh and eighth; it rose to 103.2° on the ninth, 99.4° on the tenth, 101.4° on the eleventh, 103.8° on the twelfth. The rest of the month was unusually warm. But during this period of eleven days the number of deaths from solar heat numbered three.

Several writers have referred to these two heated terms and the different effect upon the human system, and all have agreed that the case was full of mystery. As it appears that these writers were not well informed upon the subject of electricity, it was thought that this agent which they did not understand was the cause of the result which they could not otherwise explain—in much the same way that the scholiasts of the Middle Ages referred the authorship of all anonymous Greek manuscripts, out of which they could not extract any meaning, to Aristotle, by reason of his well known profundity.

But, in reality, the cause of the marked difference in the two cases is not difficult to find. In 1878, when the great mortality occurred, we had with the maximum temperatures of 97° an average daily relative humidity of 57 to 58 per cent. of saturation. The average daily humidity in 1881, with temperature of 100° to 103°, was from 38 to 40, and on one day 45, per cent. In 1878, during the greatest mortality, the relative humidity at 2 o'clock P. M. was 40 to 45 per cent. In 1881, during the

highest temperatures, the humidity at 2 o'clock was from 21 to 26 per cent. These low humidities were maintained, notwithstanding the hot July which had preceded, by reason of the fact that very little rain had fallen in Kansas, Missouri, Illinois, or Arkansas. The whole region was parched. The grass in the pastures crumbled under foot and burned like tinder. All of the small streams were dry, and most of the springs had ceased to flow. Forest trees began to wither and their leaves to fall. The only plants which seemed to be unaffected were the well known pests, the cockle burr *(xanthium strumarium)* and the Jamestown weed *(datura stramonium)*, which imparted its disagreeable flavor to the milk of cows, showing to what straits they were reduced for food. But it was this extraordinary dryness which made the extraordinary temperature endurable. And here the higher temperature of continental climates finds its compensation. The evaporation of moisture from the surface of the body goes on much more rapidly in air of low relative humidity and high temperature, and the latent heat of evaporation is continually removed from the body.

Citizens of St. Louis suffer quite as much discomfort in Philadelphia or New York, or even Boston, as at home. For my own part I suffered greater discomfort during the summer just passed in Philadelphia and Boston, with temperatures of 88° to 92°, than I did in 1881 on the prairies of Kansas and Missouri, exposed to the full blaze of the sun, with the thermometer reading from 105° to 107° in the shade.

The winter temperatures of St. Louis are, as a rule, not excessive. On the average we have about three days each winter when the temperature drops to or below —0°, and one day when it falls to or below —5°. The extreme minimum temperature observed in St. Louis is 23°, observed by Engelmann, January 5, 1884, and January 29, 1873. As a rule the winters of St. Louis are fairly well adapted to the production of the ice crop which seems to be necessary in the following summer, and lack the element of "rawness" which makes such a disagreeable feature of oceanic winters.

The precipitation of moisture is mainly in the form of rain. Snow is by no means uncommon, but it is usually light, and remains on the ground only a few hours, or at most a few days. The monthly rain-fall reaches a maximum of 5.48 inches in June, the greatest monthly rain-fall observed being seventeen inches in June, 1848.

The average winter precipitation is 7.64 inches of water, and the average summer precipitation is 13.7 inches. The average annual rain-fall is 42.5 inches, but during forty-eight years the annual rain-fall has varied from 21 to 69 inches. The greatest continuous rain-fall may be set down as 5 inches, which may be spread out over many hours, and has once been observed to fall in seventy-five minutes.

There is no element of the climate of St. Louis which differs essentially from that of other large inland cities similarly placed as to altitude and latitude, and here, to as great an extent as in any large city, the conditions of physical comfort are within the reach of the citizen.

III.

ORGANIZATION OF HEALTH DEPARTMENT, SANITARY LEGISLATION, AND THE ABATEMENT OF NUISANCES.

By JOHN D. STEVENSON, ESQ.,

HEALTH COMMISSIONER.

In the organization of the health department of this city, the distinguishing feature is the concentration of the work of the department in an individual—the abandonment of the complex system by which all the work of the department was done, through the agency of boards, commissioners, etc.

The organization of the health department of this city, as it exists today, is the creature of the present city charter,—a charter anomalous in character, specially provided for by the present constitution of the state, and designed to free the city from the baneful effects of constant interference by the state legislature with the detail of municipal government. Under this charter and ordinance of the city the health department is created. It is managed, directed, and controlled by a board of health and a health commissioner.

The board of health consists of the mayor (who is its presiding officer), president of the council, one commissioner of police (designated by the mayor), two regular practising physicians appointed by the mayor, and the health commissioner, who, in the absence of the mayor, presides.

The duties of the board of health are judicial and supervisory.

The judicial powers of the board are exercised in determining what constitutes a nuisance detrimental to the public health, and on this question their action is final. They also hear and determine applications for admission of patients to the asylums for insane.

The supervisory powers of the board of health are exercised in the quasi control of the acts of the health commissioner. He can do no act in the administration of his office, unless the same be approved by the board of health.

The board or health examines all the expenditures of the department, and their approval is a condition precedent to the payment of all bills. The meetings of the board of health twice each week are fixed by charter and ordinance.

The health commissioner, by the charter and ordinances, is specially charged with a general supervision over the public health, to see that the regulations, laws, and ordinances of the city relating thereto are enforced and observed. Subject to the approval of the board of health, he is authorized and empowered to make such rules and regulations as will tend

to preserve and promote the health of the city, and to appoint such employés as may be necessary for the execution of his orders. In person, he can enter into, or authorize any of his employés or any police officer to enter into, and examine, in the day-time, buildings, lots, and places of every description in the city, to ascertain the condition thereof, so far as the public health may be affected by it.

The health commissioner declares and abates all nuisances condemned by the board of health. In case of proclamation by the mayor that any malignant, infectious, or contagious disease or epidemic is prevalent in the city, or will probably become so, the health commissioner, with the approval of the board of health, is invested with the most ample powers to avoid, suppress, or mitigate such disease, in the same manner and as effectually as the municipal assembly could itself do by ordinance. He can employ officers, agents, servants, and assistants, establish temporary hospitals, provide furniture, medical attendance, and nurses, as in the opinion of the health commissioner may be necessary and advisable: he can exhaust the entire appropriation for the health department, if necessary. These extraordinary powers, however, cease whenever proclamation by the mayor declares that the epidemic or disease inducing his first proclamation is no longer imminent or prevalent.

It is thus seen that the effective practical work of the health department of this city is in a very large degree imposed upon the health commissioner.

The operative machinery of the department consists of the board of health, health commissioner, city dispensary, with a complete outfit of ambulances, stretchers, etc., a sanitary corps, whose principal work is frequent house inspection. The institutions of the health department are the city hospital, female hospital, asylum for insane, poor-house, wherein 415 incurable insane are cared for, and a quarantine station, permanently established by ordinance.

The treatment of epidemics calls into frequent requisition this quarantine station. Small-pox and yellow fever have thus far created the necessities for its use, and fully justify the wisdom of its establishment. Yellow fever, in its visits in 1878–'79, by the prompt removal of all cases to quarantine, was completely extirpated. Small-pox, for like reason, has at no time become even localized, much less an epidemic.

This brief sketch of the health department involves sanitary legislation to the extent of the agents employed for its enforcement. The existent legislation itself embraces a multiplicity of objects, and is intended to reach all insanitary causes that experience has demonstrated to be peculiar to urban life. The special objects are dwellings, yards, outhouses, cellars, privies, surface drainage, sewer connections, garbage, offal, stables, cow-sheds, pig-pens, stys, slaughter-houses, dairies, meat shops, markets, distilleries; soap, candle, oil, glue, hemp, varnish, and white-lead factories; pork, sausage, and lard houses, and all other industries conducted by processes injurious to the public health; carts and

vehicles used to transport garbage, swill, and all other loose material; fouled bedding, clothing, putrid meat, fish, hides; stale, decayed, and unsound vegetables; wells and cisterns, ponds or pools of offensive water; tenement houses, boarding and lodging houses,—each and all are made subjects of especial official espionage, and when found in condition detrimental to public health, ample provisions are made to relieve the city of the causes of complaint. We may also class as sanitary legislation all ordinances providing for public and private sewers, removal of slops and garbage, removing and rendering of dead animals, cleaning streets and alleys, and especially regulating the construction of tenement, boarding, and lodging-houses. The abatement of nuisances involves the enforcement of the ordinances directed against the multifarious subjects of legislation to which I have referred. Under the code of the city the offences defined for the major part of the causes are directly reached in the police courts, upon complaint being declared misdemeanors; the remainder are subjects of special hearing before the board of health, and, if adjudged detrimental to public health, are abated by order of the health commissioner, or, by repeated fines imposed for failure to obey the order of abatement, the delinquents are finally driven to submit. The process of abatement of nuisances, as provided, is not effective, being too dilatory; the invocation of the courts to give effect to the action of the board of health affords to recusants too many opportunities to evade its requirements, and in many cases the delay incident to the proceeding utterly defeats the very purposes of the law itself, in denying a speedy remedy, which is the essence of the proceeding.

I have not attempted to present the detail working of the department, but have strictly confined this paper to the designated scope of the subjects indicated in the title. Yet it is not out of place to say that the health department of this city has met the requirements of its organization, and its work has been invaluable, as is fully attested by the mortuary statistics, which are the crucial tests of this class of work.

IV.

SEWERAGE AND HOUSE DRAINAGE IN ST. LOUIS.

By ROB'T MOORE, C. E.

The sewerage system of St. Louis dates from the year 1849, which was also the year of "the great fire," and of the severest visitation of cholera in the history of the city. Prior to this time no sewers, in the modern sense, had ever been built in the city. A few stone or brick culverts had been built by private parties across the levee to drain property immediately adjacent thereto, but they were not intended for the reception of house drainage, and, as a rule, this use of them was expressly forbidden by a special proviso in the several ordinances which authorized their construction.[1] But now the building of sewers, as a sanitary measure for the removal of household and manufacturing wastes, as well as surface-water, was undertaken, and a system devised which was intended to embrace the whole city.

In taking this step St. Louis was preceded by very few cities, either in this country or in Europe. It is true that before this time sewers for the carriage of surface-water were in the older cities not uncommon. But in none of them, not even in London, was the building of sewers, prior to 1849, more than begun in any serious and systematic way as a sanitary measure. And it was common in England before this time, as it had been in St. Louis, to forbid the using of the sewers for the drainage of houses, or for the removal of anything but surface and storm-waters.

Nor was this step in St. Louis a sudden one, forced upon the people by the terrors of pestilence. The statute which empowered the city to proceed in the construction of sewers was passed during the winter preceding the epidemic of cholera, its approval being dated March 12th, 1849, and was the final result of a discussion which had been going on in the city council and in the newspapers for not less than eight years. This early discussion of the subject grew primarily out of one of the topographical features in which, as compared with other cities, St. Louis is peculiar, to wit, the presence of numerous "sink-holes" or basins, whose only drainage is through fissures in the underlying rock. These abounded in nearly every part of the city, and it was a favorite opinion with many that these natural underground outlets might be permanently relied upon to carry off not only surface-water, but sewage matter as well. One of these basins, whose centre was not far from the intersection of Ninth and Biddle streets, in what was then known as "the north-western

[1] See Ord. 626, June 19th, 1840. Ord. 679, Nov. 28th, 1840. Ord. 848, Nov. 17th, 1841. Ord. 965, May 4th, 1842. Ord. 993, June 6th, 1842. Ord. 1204, July 24th, 1843.

part of the city," was the source of much solicitude, as the area drained included many blocks, and the results of any stoppage of the outlets were sure to be very serious. During 1841 and 1842, several reports were made to the council by the city engineer, setting forth the importance of preserving these outlets; and several ordinances were passed appropriating money for the purpose of protecting them and keeping them open. In May, 1843, the city engineer, Mr. Henry Kayser, in a further report to the council, recommends the purchase by the city of the land (belonging then to Jonas Moore) upon which one of the largest of these sink-holes was located, there being, as he says, "the strongest probability that it will answer as a common sewer." The mayor, John M. Wimer, in a message to the council of the same date, also calls attention to this subject, but recommends, in opposition to the city engineer, that steps be taken towards the construction of a sewer as the only permanent and sufficient means of warding off the danger of overflow which was constantly impending. Nothing being done, the subject was again brought up, in May of the succeeding year, 1844, by the newly elected mayor, Bernard Pratte, who, in his first message, joins in the recommendation made last year by the city engineer to purchase the sink-holes, there being, he urges, "good reason to believe, from experience had thus far, that they can be used as drains or natural sewers, and serve as substitutes for artificial ones." The council referred the matter to a special committee, who, after careful examination on the ground, reported adversely to the recommendations of the mayor and city engineer, and urged the building of a sewer. Two months later an ordinance [1] was passed directing the construction of a sewer from the intersection of Seventh and Wash streets along Seventh street to Carr street, and thence under Carr street to the river, and authorizing an issue of $20,000, 7 per cent. bonds, to pay the cost thereof.

Nothing, however, was done under this ordinance, for the reason that the action proposed was beyond the powers then conferred upon the city by its charter, nor was the requisite power granted until five years later (March, 1849), as already related.

Meantime the condition of things grew steadily worse. The outlets of the sink-holes near Biddle and Tenth streets, which had been the subject of so much discussion, became stopped up, as nearly always happens in like cases, and a pond of stagnant water resulted, which was christened "Kayser's lake," after the name of the city engineer who had urged the preservation and use of these outlets as permanent sewers. The need of sewers for purposes of house drainage, and particularly for the drainage of wet cellars in all parts of the city, had also become very evident, and public sentiment was ripe for the comprehensive system of sewerage, which, as before stated, was finally begun in 1849.

The outlines of this system in its present form, which, however, is not essentially different from its original form, are as follows:

[1] Ordinance 1398, July 18th, 1844.

All sewers are distributed into three classes,—public sewers, district sewers, and private sewers. Public sewers are such as, in the words of the city charter, are "constructed along the principal courses of drainage." This class embraces all the main or trunk sewers, into which the laterals are discharged. As a rule, they are located in the valleys formerly occupied by streams, but in other cases they go through the ridges at considerable depth to drain sink-hole basins which formerly had no surface drainage. The first sewer constructed, begun in the summer of 1849, and intended for the drainage of "Kayser's lake," was of this latter kind. It is known as the Biddle Street sewer, and where it passes through the ridge, at Broadway and Biddle streets, was constructed as a tunnel at a depth of about forty feet. It is a circular brick sewer twelve feet in diameter, and was in its day counted as a great undertaking.

The largest public sewer is of the former kind, and follows the valley of Mill creek, a stream which took its name from an old mill that once stood on it, not far from Seventh and Poplar streets. West of the mill there stretched, for nearly a mile and a half, a long lake known as "Chouteau's pond," the site of which is now occupied by railroad depots and tracks. The sewer, which takes the water of the old stream, has a span of twenty feet and a clear height of fifteen feet, and is mainly built of stone. It drains an area of 6,400 acres, or ten square miles, and up to April, 1884, has cost the city $1,204,000.

All public sewers are paid for by the city at large out of the general revenue.

The second class, or district sewers, embraces such as drain limited areas or districts, the boundaries of which are, as occasion requires, fixed by ordinance. They are, in fact, the branch or lateral sewers, in contradistinction to the mains, which are included in the former class. Sewers of this class are built by the city, but are paid for by the owners of the property within the district, the cost of the sewerage of the whole district being assessed upon the several lots of ground therein in the same proportion that the area of the lot bears to the area of the whole district, after excluding all public streets and highways. The bills of assessment, which are by law made liens upon the property, are given to the contractor upon the completion of his work, and are collected by him without any recourse upon the city. Prior to 1859, the city paid the contractor in cash from the proceeds of bonds issued for each district, and collected the money from the property-owners by a special tax running through a series of years until the bonds were extinguished. But this method was found not to work well, and was abandoned for the one now in use, which is, on the whole, satisfactory.

The initiative in the construction of district sewers may be taken either by the property-holders, upon petition, or by the city authorities, who may by ordinance direct the building of sewers in any district, whenever in their judgment the public interest may so require.

After district sewers are built, they are maintained and repaired at the public cost, and are subject to the same regulation in all respects as public sewers.

The third class, that of private sewers, embraces all that are intended for the drainage of single houses or lots. These are built and paid for by the owners of the property drained, but are nevertheless by city ordinance made subject to certain general regulations, of which the following are the chief:

No private sewer can be connected with any public or district sewer, except in pursuance of a special permit therefor issued by the sewer commissioner, who has general charge of the sewerage of the city. If the private sewer is to be used for the drainage of an inhabited house, the sewer commissioner is required, before granting the permit, to satisfy himself, from an examination of the plan, a copy of which must be left with him, that provision is made, first, for preventing the passage of air into the house from the main sewer, or from any other house drain, and, second, for the ventilation of the drain within the house, by a constant circulation of fresh air. The first of these ends is accomplished by means of the ordinary disconnecting trap, which must resist the passage of air by an obstacle equal to at least one inch in depth of water. The second is attained by requiring that there shall be an air inlet between the trap and the house, and that the main soil pipe shall be continued above the house and left open.

The size of the drain and the materials used must also be approved by the sewer commissioner, and the work of making the junction with the main sewer must be done in the presence and to the satisfaction of an inspector detailed from the department for that purpose. But beyond these general provisions all the details of the work within the house are left to the discretion of the owner.

For private drains of any kind exceeding one hundred feet in length, the sewer commissioner can grant the permit only when the plan and profile of the proposed work have been approved by the board of public improvements, and upon the deposit with the city treasurer of money sufficient to pay the wages of an inspector appointed by the sewer commissioner to see that the work is properly done.

These regulations concerning private sewers are of comparatively recent date, the greater part of them having been drawn up by the writer whilst acting as the first sewer commissioner under the present city charter, and passed by the municipal assembly in 1877 and 1878. Before that time, it was the rule, here as elsewhere, to leave the private householder free to construct his house-drains in any manner he saw fit, provided only that he did not injure the main sewer by his manner of making the junction. As a consequence, these drains were very commonly constructed in gross violation of all the requirements of sanitary science. In particular, no attention whatever was paid to the ventilation of house-drains. The soil pipe was terminated at the highest fixture, and there was no provision for admitting any air, except that of the main sewer. In this, however, St. Louis was not behind other American cities, and the ordinance passed here providing for the ventilation of all house-drains built thereafter, and their disconnection from the air of the sewer, was, I

believe, the first one of the kind enacted in this country, though such ordinances since then have become very common.

Each of these three classes of sewers is designed and used to carry off the rain-fall, as well as the waste water from houses, and the whole, therefore, is an example of what is known as the "combined system." At first, indeed, the chief object of their construction was to get rid of storm-water, which, by collecting in ponds and cellars, had become a nuisance. With sewers already built for this purpose, the construction of another system, for the carriage of house-drainage only, as would be required to meet the views of the more strenuous advocates of the "separate system," has been found wholly unnecessary, and has not even so much as been thought of. Nor, so far as the writer knows, has this two-fold use of the sewers been productive of any evil results whatever.

The amount of rain-fall which the public and district sewers are designed to carry is one inch in depth per hour from the whole area drained, experience having shown that the sizes given by this condition are admirably suited to the local circumstances. House-drains are designed to carry off a still larger rain-fall, for the reason that the water which they receive gets into them much quicker than in the case of sewers draining larger areas. The usual rule is, to make them large enough to carry off two inches per hour from the whole surface of the lot drained. The size of pipe called for to satisfy this requirement is very seldom larger than six inches, though prior to the adoption of the present regulations it was not uncommon to lay a twelve or even a fifteen inch pipe for the drainage of a single house.

The grades of the sewers of all classes are as a rule quite steep. The minimum is one foot in one thousand, or one tenth of one per cent., which is the grade of part of the Mill Creek sewer. The grades of other sewers range from this up to eight or ten per cent., the latter figure being not uncommon for house-drains. The average in the district or lateral sewers is about one per cent., which is sufficient to secure a cleansing flow, and there is, I believe, no point in the city from which the sewage is not carried to its final outlet within an hour after its entry.

This final outlet is in all cases the Mississippi river, whose rapid current and enormous volume are sufficient to carry off and harmlessly absorb all that can be brought to it. In this great receiver, St. Louis is particularly fortunate, as it forever settles the question of sewage disposal, which in many other cities is one of very great and ever-increasing difficulty. It makes possible, and fully justifies here, a system of drainage which in other places and under other conditions might be impracticable and unwise.

In pursuance of the general plan thus outlined, work has gone forward with varying speed, until, up to April, 1884, there were built and in use $48\frac{1}{2}$ miles of public sewers, $174\frac{9}{10}$ miles of district sewers, and about $58\frac{4}{10}$ miles of private sewers, including house-drains, making a total of all classes of $281\frac{8}{10}$ miles. The area drained by district sewers is 4696 acres, or $7\frac{1}{3}$ square miles. This embraces a large portion of the closely

built parts of the city, including nearly all to which water pipe has been extended, as will more clearly appear from a map published with this, on which the districts supplied with sewers and with water pipe are indicated by coloring.

The cost of the system, exclusive of private sewers, whose cost is unknown, is as follows:

Public sewers, . . .	$2,942,827,	being	$60,816	per mile.
District " . . .	$2,932,588,	"	$16,758	" "
Total,	$5,875,415	"	$26,300	" "

The results obtained by this large expenditure have been highly satisfactory. Before the construction of sewers, much trouble was experienced throughout the city from standing water in cellars, even in the higher parts, where such a thing would hardly be expected. Cellars of this sort frequently and very naturally became receptacles for garbage, and even under the most favorable circumstances were offensive and dangerous. So great was the difficulty of keeping cellars free from water, that it was not uncommon for persons who had put them under their houses to fill them up again.[1]

As a natural result of this state of things the rate of mortality was very high. In the fourteen years from 1841 to 1854 inclusive, the average death-rate is given by Dr. George Engelmann, after a very careful study of the records, as $43\frac{6}{10}$ per 1000. Of these years, no less than five (viz., 1849, 1850, 1851, 1852, and 1854) were marked by the presence of cholera, which found here such a congenial home that it threatened to become a permanent resident. But even after eliminating the deaths from cholera, Dr. Engelmann finds the normal death-rate of that period to be no less than 34 per 1000.[2]

To-day a permanently wet cellar in St. Louis is a rare phenomenon. Within the area covered by sewers, the soil has been rendered thoroughly dry and clean. And taking the statistics of the last eight years, from 1876 to 1883 inclusive, we find the average death-rate to be now but $19\frac{8}{10}$ per 1000, or less than 60 per cent. of what it was before the construction of sewers, and as low as any large city in the world.

[1] The testimony on this subject in the newspapers of 1849 is very ample. Thus, on January 27th, 1849, the *St. Louis Republican*, conducted by Col. A. B. Chambers, states editorially that "There are few blocks in the city where there are not cellars containing more or less water. A large number are full, or nearly so, particularly east of Fourth street." In its issue for January 3d, the same paper has the following: "There are cellars in Pine, Olive, and Locust streets that have not been free from water for years past, and even now their condition is most offensive." On the same date Doctors Pope, McMartin, and McCabe, in a memorial to the board of health, say,—"Numerous cellars and basements, flooded as they are after every rain, are believed to be one of the most prominent sources of disease in St. Louis."

On February 28th, the *Republican*, in an editorial, has the following: "At present, the street gutters are the only sewers. These in warm weather become exceedingly offensive. In addition, in many parts of the city cellars cannot be kept dry. Day before yesterday we saw the owner of a block of buildings filling up finished basements because of the impossibility of draining them."

[2] See paper by Dr. George Engelmann in "Report on Diseases of Missouri and Iowa, by Thomas Reyburn." Philadelphia, 1855.

Of course this result is not due to any single cause. An improved water-supply, better housing, an increased knowledge of the laws of health, and more vigorous measures to abate nuisances and stamp out contagious diseases, have all contributed to lengthen life and lower the death-rate. But with all this, nothing is more certain than that these agencies would have been comparatively futile without the purification of dwellings and the drying of the soil, which the construction of sewers alone has made possible.

MAP OF PART
OF THE
CITY OF SAINT LOUIS,
SHOWING THE
Districts Supplied with Water-Pipe
and with Sewers.
Prepared for 12th Annual Meeting A. P. H. A., Oct. 1884.
Scale 2200 ft. per inch.
EXPLANATION.
shows Districts Sewered and Supplied with Water.
shows Districts Supplied with Water.
shows Districts Sewered.
Water-pipe in use April, 1884, - - - - - 238 Miles.
Public and District Sewers Completed April, 1884, 223 5/10 "
Private Sewers, about - - - - - 58 5/10 "
MISSISSIPPI RIVER
EAST CARONDELET
CARONDELET PARK
ARSENAL ISLAND
CAHOKIA
TOWER GROVE PARK
FOREST PARK
LAFAYETTE PARK
FAIR GROUND AND ZOOLOGICAL GARDEN
BELLEFONTAINE CEMETERY
CALVARY CEMETERY
O'FALLON PARK
HYDE PARK
ST. LOUIS WATER WORKS
VENICE
KERR'S ISLAND
CITY OF EAST ST. LOUIS
TOWN OF BROOKLYN

MAP OF PART OF THE CITY OF SAINT

SHOWING THE

Districts Supplied with

and with Sewe

Prepared for 12th Annual Meeting A. P. H.

Scale 2200 ft. per i

V.

THE PUBLIC WATER-SUPPLY OF ST. LOUIS.

By THOS. J. WHITMAN, C. E.,
WATER COMMISSIONER.

The first works to supply the citizens of St. Louis with river water, delivered through pipes, were commenced in 1829, and went into operation in the latter part of 1831. The enterprise was started by private individuals, but the works came into possession of the city about the time of their going into operation, or soon thereafter. Previous to this time the water used was obtained from wells, and though clear and palatable, it contained too much lime to be fit for manufacturing purposes, and was so subject to contamination from the drainage of a closely populated town as to make its use for domestic purposes undesirable.

The capacity of the works, as established in 1829–'31, was extended and improved from time to time until 1867–'68, when the water consumption of the city had reached about seven and a half to eight and a half millions of gallons per day. At this time (1867–'68) the pumping engines were located on the river bank at the foot of Bates street. This location was below, as regards the flow of the river, the drainage of over one third of the populated area of the city. The water was pumped to a reservoir located about a mile back from the river, on the high ground near 20th and Benton streets. This reservoir, when first built, had a capacity of about forty million gallons, but in 1867 had become so filled with sediment that practically it afforded no storage capacity, its use being little more than that of a stand-pipe, so that the water was delivered to the distribution pipes and thence to the consumers in just about the same condition as when taken from the river.

In 1868 the total length of pipes had reached about eighty-one miles, of which length fifteen miles was four inches and under in diameter. In 1865, surveys, reports, and plans were made, looking not only to the procurement of an increased supply, but also toward improving the character of the water to be furnished. These efforts culminated in the adoption of a general plan for new works, the construction being commenced (under the direction of the writer) in June, 1867.

The new system of works went into operation June, 1871, since which time the old works (except the pipes for distribution) have been wholly abandoned. The pumping station of the new works is at Bissell's Point, about two and three fourths miles above the Bates Street station. At the time of location, Bissell's Point was just at the northern limits of the city, though since then the city limits have been

extended some six miles above this point. The main and peculiar feature of the new works was the providing of a set of reservoirs called "settling basins," in which the water, before being delivered to consumers, was to remain long enough to allow the deposit of the greater part of materials carried by it in suspension when taken from the river. This arrangement required that the water be pumped twice, once from the river into the basins for settling (this pumping being called "low service"), and after settlement the clearer water to be pumped into the distribution pipes and storage reservoir (this second pumping being called the "high service").

The water is received from the river in an inlet tower placed in deep water about two hundred feet from the shore line. The water is conveyed through a sixty-six inch cast iron pipe to the low service engines, which are located on the river bank. These engines pump the water to the settling basins, four in number, holding about eighteen million gallons each, where it is allowed to stand from eight to eighteen hours, or as long as the present demand for water will admit. The quantity of sediment deposited in the settling basins, and removed each year, amounts to from one hundred and eighty to two hundred thousand cubic yards. From these basins the water is drawn off to the high service, and raised by the engines there through three lines of thirty-six inch pipes to the stand-pipe, whence it flows through two lines of thirty-six inch mains to the distribution pipes and storage reservoir. The stand-pipe is located on the high ground at the intersection of 20th street and Grand avenue. The limit of water line in stand-pipe is two hundred and eighty feet above the high service pumps. The storage reservoir is located at Compton hill, in the southern part of the city, and about five miles from the high service station. Its capacity is sixty million gallons, the high water line being at an elevation of one hundred and seventy-six feet above the city directrix.

At the present time (summer of 1884) the daily consumption of water is from thirty to thirty-three million gallons. The length of pipes is about two hundred and fifty miles, on which are placed twenty-two hundred and fifty fire-plugs, and thirty-five hundred and fifty stop-valves. The number of service taps is about thirty thousand five hundred. The population living within the water-piped area may be estimated at from three hundred and twenty to three hundred and forty thousand.

If the water, as taken from the river, could be left in the settling basins for from twenty to thirty hours, we should have a fairly clear water of most excellent quality. To have it entirely clear, some method of filtering or clarification would have to be resorted to. A sample of the water taken from the river, at the works, last August, contained 76.57 grains of matter in suspension per gallon. An analysis of a sample of water drawn from the service pipes, after passing through the reservoir (taken at about the same time), is reported upon by the chemist, Mr. F. H. Williams, as follows: "The sample was drawn from the supply-pipe of an establishment where water is constantly used in large quantities. As

the suspended matter in the water was in such a fine state as to require days for its sedimentation, it is practically as though it were in solution, and therefore no separation of the suspended matter was made. The residue left on evaporation of the water contained inorganic matter to the amount of 14.561 grains per gallon, as shown by the analysis.

Chloride of sodium	0.835 grains per gallon.
Sulphate of soda	2.452 " " "
Sulphate of potash	0.625 " " "
Sulphate of lime	1.633 " " "
Carbonate of lime	4.808 " " "
Carbonate of magnesia	2.209 " " "
Alumina and oxide of iron	0.547 " " "
Silica	1.452 " " "
Total	14.561
Free ammonia	0.016 parts per million.
Albuminoid ammonia	0.088 parts per million.

The water was tested for nitrates, but they were not found to be present in appreciable quantities. Hardness (by Clark's soap test) was found to be eight degrees. In this connection it should be stated that the deposit of sediment in the storage reservoir is a little less than six inches thick. This reservoir has been in constant use since 1871—thirteen years. This would go to show that the settling basins do their work pretty well, though their capacity is much too small.

For some years it has been evident that the capacity of the entire works should be largely increased. During the summers of 1880–'81–'82 the consumption was quite equal to the pumping capacity, and the limit of the capacity of the present settling basins for thoroughly settling the water was reached some eight years ago. An extension of the works is now under construction. It is contemplated to enlarge them gradually to an ultimate capacity of ninety million gallons of settled and filtered water per day. It is proposed that the low service station shall be removed about six miles up the river, so as to be for all time to come beyond possible contamination by the city drainage. The high service station will remain in its present location, but will be so arranged that there will be two separate and distinct buildings, about three hundred feet apart, each supplied with pumping engines of a daily capacity of sixty-two million gallons. From the new house a separate system of pump mains will be laid to a second stand-pipe located about eight hundred feet from the present one. From the two stand-pipes the water will be carried to the distribution pipes and reservoir through lines of thirty-six and forty-eight inch pipes laid in different streets. It is not considered probable that any accident can ever occur that will disable both high service stations at the same time. This arrangement may therefore be considered as insuring as continuous a supply as if the water were obtained by gravity. The low service pumping, being under so light a head, can be maintained with certainty without requiring a duplication in this manner. When the extension of the works, as contemplated, is completed, the water-supply of the city of St. Louis will be equal to the best.

VI.

STREET AND ALLEY PAVING IN ST. LOUIS.

By JOHN W. TURNER, C. E.,
STREET COMMISSIONER.

The limestone foundation with which St. Louis is underlaid, cropping out as it did along the river front in bold bluffs, is a sufficient explanation of the fact that at first, and for a long time afterwards, limestone was the only material used here in the paving of the streets and alleys. It was first used in the form of rectangular blocks set on a bed of sand, the earliest example of this sort being a pavement laid on Main street in 1823. Nine years later, in 1832, an experiment was made with a layer of stone broken into small pieces, and afterwards consolidated by the traffic, after the plan which Macadam had, during the earlier part of the century, made popular in England, but which was in this country as yet somewhat of a novelty.

Until 1860 these two forms of pavement were the only ones in use, the limestone blocks being used for business streets and for alleys, where the latter were paved at all, whilst the limestone Macadam was adopted everywhere else. Since 1860, experiments have been made with almost every known material or form of paving, including wood, iron, bricks, porphyry, granite, asphalt in blocks, and asphalt in sheets; and specimens of each one of these, iron alone excepted, can now be found in the streets of St. Louis.

The principal materials in use may be seen from the following statement of the city pavements as they existed April 1, 1884;

	Miles.
Limestone Macadam	292.74
Granite and porphyry blocks	8.09
Wood blocks	6.40
Telford Macadam	4.70
Asphaltum sheet	2.58
Limestone blocks	1.45
Bricks and asphaltum blocks	.15
Total paved streets	316.11

To which should be added 66.09 miles of limestone block paving on alleys.

From this it appears that in point of mileage, limestone Macadam leads all the rest. This is due not to its intrinsic excellence, though it is infinitely better than nothing, but to the fact that for the great majority of streets, nothing better can be afforded. For, owing to the friable

nature of the stone here, the ordinary disadvantages of all Macadam pavements—mud in wet weather, and dust in dry weather—are found in St. Louis to an exaggerated degree. But whilst this is a source of much discomfort, and detracts greatly from the appearance of the city, the powdered limestone can hardly be called dirt in the sanitary sense, and, except as it may cause or exasperate diseases of the air passages, it is perhaps of no injury to the public health.

As a covering for alleys, the limestone block pavement, which is in almost universal use, has much merit. It allows the water to run off rapidly, and admits of perfect cleaning. Brick or sheet asphalt would, perhaps, be still better, but with these exceptions the alley pavements of St. Louis deserve to rank amongst the best. During the cholera epidemic of 1849, one of the chief difficulties in the way of the cleansing of the city, which was then undertaken, was found to be in the unpaved condition of the alleys. In fact, any thorough cleaning in such cases was impossible, and the committee of public health, who during the epidemic exercised a sort of dictatorship, mentioned alley pavements as one of the greatest needs of the city. The lesson taught then seems to have been well learned, and, except in the outskirts, unpaved alleys are now in St. Louis the rare exception.

The experience of St. Louis in wood paving has not been very encouraging. As a rule, pavements of this class have shown marks of widespread decay in four or five years, and in six or seven years have required entire renewal. They have, therefore, proved to be very expensive and unsatisfactory. A further experiment is now being made in the residence part of the city with blocks of gum-wood treated with chloride of zinc, and laid on a foundation of hydraulic cement concrete. But with this exception the wood pavements are all being relaid with granite blocks.

The purpose of the city authorities in the scheme of street reconstruction now in progress is to pave all streets of heavy traffic with granite blocks laid on concrete; to pave with asphaltum such streets of lighter traffic in the residence part of the city as will bear the expense of it, leaving the outlying streets to be paved with limestone Macadam laid upon a Telford base. If, when this scheme is carried out, a somewhat greater expenditure be made for street cleaning, and in summer for systematic sprinkling, the sanitary condition of the city, as regards its pavements, may be considered as fairly satisfactory.

VII.

THE LOCAL MILK-SUPPLY—ITS SOURCES AND QUALITY.

By JOSEPH SPIEGELHALTER, M. D.,

MEMBER OF THE BOARD OF HEALTH, ST. LOUIS.

During the past few decades, the attention of sanitary authorities has been more than ever directed towards the detection and prevention of adulterations of different articles of food. A great deal has been done in late years in this direction, but a great deal more remains to be done. The most important part of the work has until recently been sadly neglected; that is, the sanitary control of the milk traffic.

If we consider that milk forms the principal food for children, and is most commonly used as a substitute for mothers' milk for infants, who, from whatever cause, cannot be nursed at their mothers' breasts, the importance of the good quality and purity of this article is apparent; and it strikes us at once that the great difference in the mortality among children under five years of age in cities, as compared with that in rural districts, must, to a great extent, be owing to the quality of the milk sold in cities.

Here is a large field for the sanitarian.

In Europe the governments have made ample provision for the protection of the public in this direction, and the sanitary and police authorities exercise a rigid control over the milk offered in the market. In the United States this duty is left to the state and local authorities, and in some of the states laws have been passed, which, if properly enforced, would put a stop to adulterations of milk and other articles of food. Here, in St. Louis, I am sorry to say, very little, or, rather, nothing, is being done in this direction at the present time. We have an ordinance forbidding the adulteration of food, milk, etc., forbidding the sale of watered milk, etc. (secs. 8 and 11, Art. XLV, Rev. Ord.), but this enactment is a dead letter so long as the city fathers in their wisdom refuse to furnish the health department with the means necessary to enforce the same. Nothing short of an epidemic will convince the average city father of the fact, that money spent for sanitary measures is money well invested; or, to use an old adage, that an ounce of prevention is worth a pound of cure. The cholera epidemic of 1866 and 1867, for instance, demonstrated to the city government the necessity for the extension of our sewer system after all previous arguments had failed to do so, and the same epidemic caused a reorganization of the health department, and liberal appropriations for the same.

Under such favorable circumstances, the board of health in 1871 could afford a city chemist, whose duty it was to look after the adulterators of food, the quality of the drinking-water, ice, etc. This liberal municipal spirit did not last long, however, and in 1875 the office of city chemist was abolished for want of funds. I will state briefly what was accomplished during the four years, from 1871–1875, in the way of improving the quality of milk sold in this city. From the first annual report of Dr. D. V. Dean, city chemist, dated June 1, 1872, it appears that nearly all the milk sold in 1871 was adulterated with water to the extent of 27 per cent. of its volume, not to speak of impurities, and the poor quality of the article derived from swill-fed cows.

During the year 1871, 1064 samples of milk were examined, of which 80 were milked in the presence of the messenger of the board, 22 were brought by persons who had purchased the same as pure milk, and the rest were taken from delivery wagons, stands, groceries, depots, etc. The following is a summary of extremes and averages of the quality of the milk as supplied to the city, and the same from dairies when milked in the presence of the messenger of the board:

	Average volume of cream—per cent.	Extreme volume of cream—per cent.	6 per cent. volume of cream and under—per cent.	8 per cent. volume of cream and over—per cent.	Extremes of solids—per cent.	Average solids—per cent.	Extremes of water—per cent.	Average of water—per cent.
Delivery	5.51	.5 to 20	74.6	15.66	5 to 16.5	10.3	95 to 83.5	89.7
Dairies	11.15	7 to 25	10 per cent. volume cream over 76.31	12 per cent. volume cream over 26.31	12.78 to 15	13.6	87.22 to 85	86.4

The extremes in the volume of cream in milk taken from the stands, groceries, etc., were greater than those in milk taken from delivery wagons. This is owing to the greater facilities for adding water at the stands, and to the fact of water being added sometimes without knowledge of the degree of previous dilution. Besides this, the milk is not shaken as in the wagons, and the cream rises and may be removed, or the milk and cream may be unevenly dispensed, bottom or thin milk being supplied to one customer, and surface or rich milk to another. The adulteration in most cases was simply water: some samples were found which contained boiled ship-stuff, and others to which infusions of screenings, oats, and bran had been added. A considerable quantity of dirt, and of living decomposing matter, is added to milk from water from roofs, standing casks, poor wells or cisterns. One sample of two ounces of milk, purchased as "baby-milk," poured into a precipitating glass,

showed a deposit of nearly a cubic inch of silt, particles of the hulls of grain, etc. Such substances were found in great abundance in winter milk supplied to St. Louis by some of the country dairies, but to no such extent as in that supplied by the swill dairies of the city. Using conical test tubes, a sediment composed of hairs and fragments of bran, particles and structures from the different cereals, rust spores, the pap of distillery wash, silt, etc., are found in so considerable proportions that it is difficult to resist the supposition that it comes from added infusions, or decoctions of different grains and bran; but the vegetable structures are largely broken up into their elements, and the greater part of the starch granules do not show the normal reaction with iodine, but act like the starch which has passed through the alimentary canal of an animal. Cows were repeatedly milked in their stalls in the presence of the messenger, and the examination of the milk always gave the same result. In one of these samples of a few ounces a single microscopic preparation from the sediment contained three meal mites (acarus farinæ, an acarus found in injured flour), with several ova of the same species. The presence of these in the milk is suggestive of the wretched surroundings which furnish them.

From an area of three or four square feet of mould on a loose board partition, separating the living room of the family from the cow-stable, the chemist, Dr. Dean, stripped a small patch, which contained bran, meal, ship-stuff, and the like, and occasional "acari." The proprietor of the dairy informed him that every drop of his cows' milk was strained five or six times before it was sent to market—a statement implying a very disagreeable necessity. When, as in such instances, all sanitary laws are disregarded in the feeding and general care of the cows, when swill forms the principal food for the cows, when the stables are reeking with filth, the milk cannot possibly be good and healthy, and it is not at all surprising that babes cannot thrive upon it. But not only is the health of consumers affected by impure and adulterated milk, their purses suffer likewise by the nefarious practice of watering the milk, as will appear from the following tables taken from the city chemist's report of 1872. The number of cows in the city at that time, according to the census taken by the police and the messengers of the board of health, was 7,000
and the number from outside the city was 1,800

making a total number of cows supplying the city with milk . . 8,800
but taking a round number, it may be said that the total number of cows supplying milk for the city was 9,000
The number of gallons of milk and cream supplied per day, if cows average one and one half gallons all the year round, would be 13,500 gallons; five per cent. of this is removed as cream, leaving the number of gallons of milk furnished by cows per day . . 12,825
The number of gallons daily consumed in the city, at the rate of one quart for five persons, the population being estimated at 350,000, is 17,500

The number of gallons of milk consumed each day in excess of what is furnished by cows, *i. e.*, added water, is 27.6 per cent., or 4,675

Cost to the inhabitants per year for water added to and sold for milk at the rate of 27 cents per gallon, $400,721.25.

From these figures it appears that the population of this city has been robbed of nearly half a million dollars a year by men who sold water for milk at the rate of twenty-seven cents per gallon.

This is more than one hundred times the amount for which a chemist and a few dairy inspectors could be engaged; and yet the office of city chemist and microscopist was abolished in 1875 for alleged reasons of economy, and has not since been reëstablished.

In order to still further illustrate this perverse policy of economy, I shall give the comparative table showing the amount of water added, and the volume of cream contained in the milk found during the years 1871–1874, according to the chemist's report of 1872, '74, '75:

	Number of samples examined each year.	Average volume of cream per cent.	6 per cent. volume of cream and under.	8 per cent. volume of cream and over.	Added water per cent.
1872	1064	5.51	74.6	15.66	27.6
1874	848	6.66	53.0	36.46	1.4
1875	629	8.25	42.7	47.37	3.2

This table shows very plainly the effect of the labors of the city chemist in the prosecution of the adulterators of milk. During the years 1874 and 1875, the water added to the milk was but 3.2 per cent., while the volume of cream increased from 5.51 to 8.25 per cent. The consumers, therefore, bought 24.4 per cent. less water, and received 2.74 per cent. more cream in their milk than previously. With milk at 27 cents, and cream at $1.20 a gallon, and a quart of milk to every five persons per day, the yearly saving of 400,000 people in water alone amounts to $413,040, and the gain in cream belonging to that quantity of milk, $240,034, making a total annual saving of $653,074. Exactly how much we have paid for water during the last nine years, since the office of city chemist was abolished, I am unable to state; but, taking the calculations of Dr. Dean to be approximately correct, I may safely say that the amount of money which the people have paid for water, and lost in cream due to them, during these nine years, would be sufficient to build the much needed new hospital and addition to the asylum for insane, and still leave enough for the erection of a respectable city hall.

The sanitary condition of the dairies has been materially improved

during the past nine years. By the energetic action of the board of health, the worst of the city dairies, especially those where swill was almost exclusively fed, have been exterminated; others have been driven outside of the city limits, where the cows can at least have the benefit of fresh air, and perhaps some pasturage.

From a census of the dairies inside the city limits, which was recently taken by the health department, Dr. W. Hall, chief sanitary officer, has compiled the following table showing the number and sanitary condition of the dairies and cows within the city:

Total number of cows in the city	5868		
Of this number there were in good condition . . .	5179	or	88.2%
" " " " " " fair " . . .	92	"	1.6%
" " " " " " filthy " . . .	597	"	10.1%
The total number of dairies was found to be	240.		
Of these there were in good condition	178	or	74.1%
" " " " " bad "	18	"	7.5%
" " " " " fair "	5	"	2.1%
" " " " " filthy "	39	"	16.2%
The ventilation was found to be good in 89 dairies, or			37.1%
but was found to be not good in 32 " "			13.0%
Condition of ventilation not ascertained in 119 " "			49.6%
Dairies having good drainage were 104 "			43.3%
" " defective " " 41 "			17.1%
" " poor " " 7 "			2.9%
Condition of drainage not stated in 88 " "			36.6%
With regard to food, Dr. Hall states the number of cows fed on ordinary food, including malt, bran, and hay mixed with swill, to be	3395	or	57.9%
Same food without swill	925	"	15.9%
Fed on good mixed feed with swill	1025	"	17.4%
Fed on good mixed feed without swill	410	"	6.9%
Kind of food not stated	114	"	1.9%

This report shows that the dairies need frequent inspection to keep them up to the ordinary sanitary requirements, and that swill is still fed in considerable quantity, although it is in no instance used as principal food, as was done in former years.

But this report also shows that the main source of supply of milk has been changed. While the population, and consequently the demand for milk, has steadily increased, the number of milch cows in the city limits has decreased from 7,000 in 1871 to 5,868 in 1884. It is safe to state that more than one half of the milk consumed in the city now comes from the country, and is distributed by the different dairy companies here. These dairy companies, getting their supply from the country, are, of course, not willing to pay freight for water, a commodity which can

be had here at a nominal price, and of better quality than the average dairy farm furnishes.

It is therefore to be presumed that they receive their milk unadulterated with water, and stretch it only when the demand exceeds the supply. I have not been able to ascertain the daily quantity of milk shipped to these companies, and can only speak of one, which, however, is a model in its way. I mean the St. Louis (or Cabanne) Dairy Co., which distributes daily about 900 gallons of milk and about 125 gallons of cream. They have a laboratory in connection with their milk depot, and examine and analyze their supply of milk regularly; they also exercise a strict control over their delivery wagons.

A similar system of examination and control of the milk, inaugurated by the city authorities, would save the citizens hundreds of thousands of dollars a year, not to speak of the beneficial influence it would have in lowering the death-rate of children. It is astonishing how indifferent many people are to the quality of milk they buy. Men who otherwise are very particular as to what they buy, and who want to get their money's worth in every other purchase, consider the addition of water to milk a harmless fraud or adulteration. It may be worth while to illustrate the harmlessness of this adulteration:

The water-supply of the dairies is generally derived from a cistern or well on the premises, and is more or less contaminated by the seepings from the cow-stable or manure pile. But supposing they get their water from some well in the city, they are not much better off. Fully two thirds of the 9,000 or 10,000 wells in the city are contaminated with sewage. Besides other impurities, the water generally contains micro-organisms of different kinds, and in times of an epidemic especially is full of disease germs. It is almost impossible to obtain pure water in the city, except by filtering, or boiling, or both. Even the hydrant water is far from being pure, and at times contains a considerable quantity of vegetable matter. Taking into consideration now the fact that milk is known to be the best propagating and breeding menstruum for all kinds of micro-organisms, we can well imagine how the seemingly harmless addition of water to milk may, under certain circumstances, transform the same into a first-class poison, spreading disease and death to the unsuspecting victims. These facts here set forth ought to be sufficient to explain the absolute necessity of a rigid and efficient control of the milk-supply; but I will give some figures which will demonstrate the necessity from another side. In order to be able to say something about the quality of the milk at the present time, I requested Dr. Heckelman to analyze a few samples of milk procured from different dairies and milk depots in the city.

The result is as follows: Of the four samples examined, all of them were skimmed; the volume of cream contained in the milk ranged from 4 to 10 per cent. instead of 15 per cent. Two of the samples were watered to the extent of 10 or 12 per cent.

Taking the average volume of cream of the four samples to be 7 per

cent., the consumers were robbed of 8 per cent. of cream to which they were entitled. Assuming the average quantity of milk consumed to be one quart a day for every five persons, and the population 400,000, the amount of milk consumed would be 80,000 quarts, or 20,000 gallons; 15 per cent. of this should be cream, but only 7 per cent. is furnished with the milk sold for unskimmed milk. The missing 8 per cent. of cream for 20,000 gallons amounts to 1,600 gallons per day, which, at $1.20 a gallon, is worth $1,920 a day, or $700,800 a year. Even if we wished to be modest, and be satisfied with only 12 per cent. volume of cream in our milk, we are still 5 per cent. short of what is due us, and this 5 per cent. of missing cream represents a value of $438,000 a year.

Calculating an addition of only 10 per cent. of water sold with the 20,000 gallons of milk every day, we have 2,000 gallons of water sold for milk at a cost of twenty-eight cents per gallon, and amounting to $560 a day, or $204,400 a year. If all appeals for the protection of the poor innocent children are of no avail, these figures should be sufficient to convince any one that it is very poor economy to lose $900,000 in order to save the paltry sum of $4,000 or $5,000, which the sanitary control of the milk supply of the city would cost.

VIII.

THE LEADING LOCAL PRODUCTIVE INDUSTRIES, AND THEIR EFFECT ON THE HEALTH AND LIVES OF THEIR OPERATIVES.

By GEO. HOMAN, M. D.

I am unable at present to offer more than a preliminary statement on the subject assumed by me in the local series of papers, as, from its nature, a somewhat extended period of observation of the effects of a given employment on those engaged in it is necessary in order to enable the observer to deduce just and accurate conclusions therefrom.

When the idea of a survey of the existing hygienic situation in this city was first suggested, it was thought to be an important part of the scheme that inquiry should be made into the condition and environments of operatives in our leading lines of manufacture; and in pursuance of this idea, a circular was prepared, and addressed to the proprietors and managements of establishments devoted to brewing, tobacco manufacturing, ore smelting and metal working, jute and cotton manufacturing, and the making of drain pipe, fire brick, etc., these enumerated industries being among those here which employ the largest number of operatives, especially young people of both sexes between 12 and 21 years of age.

While the responses received in answer to the circular thus sent out were encouraging, it was believed, after due reflection, that the attempt to include all the lines of business named would result in but partial success, and the collection of imperfect and insufficient data; and it was therefore decided to restrict the inquiry for the present to the single line of tobacco manufacture—an industry that has had such a remarkable development here within the past few years as to place the St. Louis district very nearly, if not entirely, in the lead in this country as regards magnitude of output of the manufactured product.

The factories here number some half dozen establishments, each employing from 200 to 1,000 hands—the number employed depending on, and varying somewhat with, the season. In the plug, smoking, and fine cut tobacco factories, a large proportion of the hands are boys and girls above 12 years of age, who strip the leaf from the stem, and whose wages are based on the amount of work they perform.

These establishments, with one or two exceptions, are new and large, and were planned and built with a very considerable degree of reference to the needs and comforts of the employés.

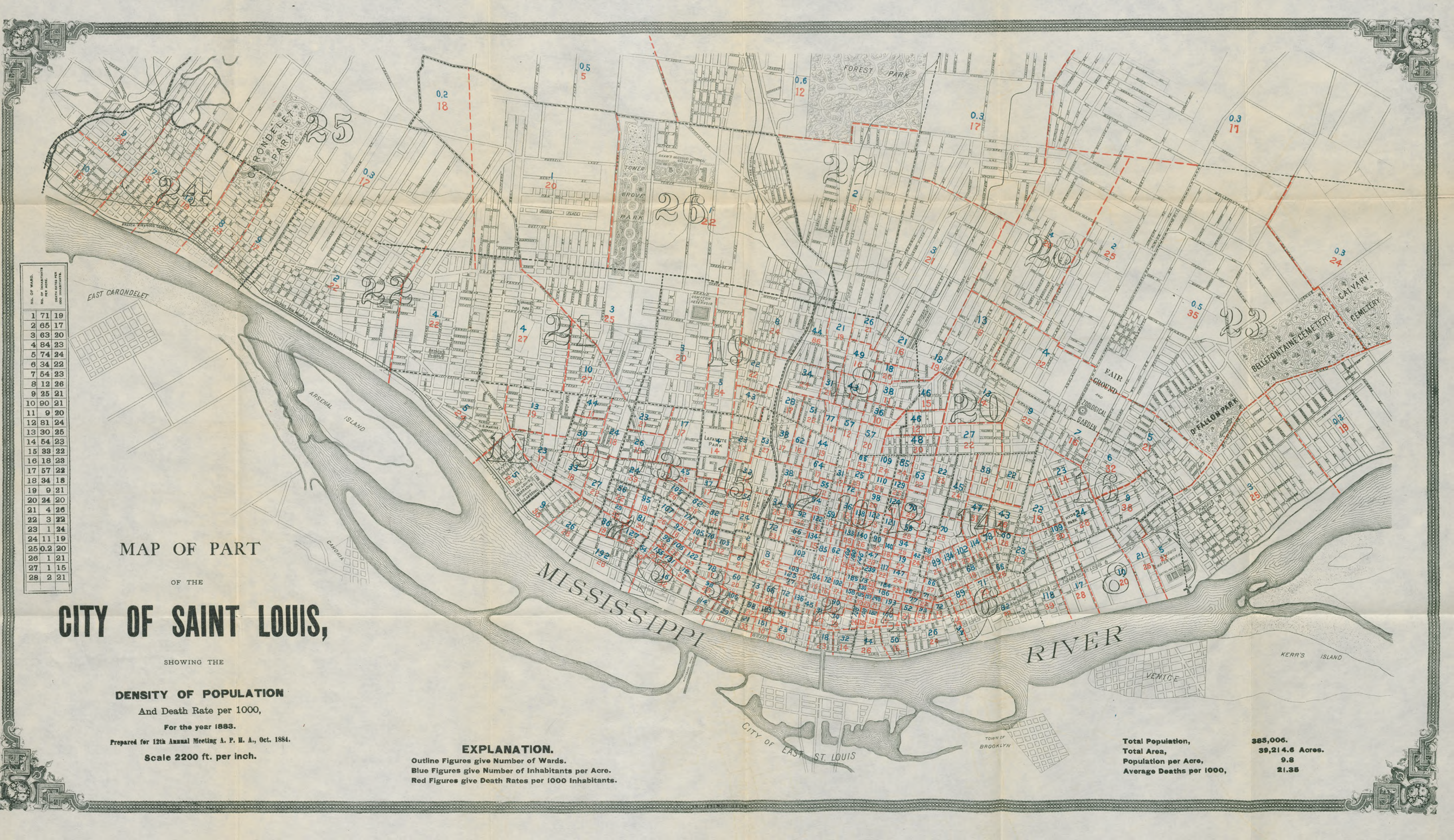
The blank forms for use in the prosecution of this inquiry were prepared after consultation with gentlemen engaged in the tobacco

business, and space in them is allowed for careful classification as to age, sex, nativity, color, social relations, domicile with parents or other relatives, length of time employed, and locality of residence—this information to be furnished by the managements of the factories in which the inquiry is prosecuted.

The points to be noted by medical and hygienic inquiry and observation as regards the personnel of the establishments, and surroundings of employés during hours of labor, are as follows:—

1. Hours of labor and how paid. By the day, or by the piece?
2. Character and situation of buildings and rooms where employés work.
   - *a.* Average space allowed each employé.
   - *b.* Means provided for ventilation, lighting, heating, etc., in all seasons.
   - *c.* Conveniences afforded employés, as elevators or stairways, drinking-water, dressing-rooms, water-closets, etc.
   - *d.* Care bestowed on interiors (walls, floors, etc.), as painting, whitewashing, scrubbing, and sweeping.
   - *e.* Amount of dust or other floating matter in the air.
3. Effects of employment observed in those working in tobacco.
   - *a.* General physical appearance of operatives of all classes. Differences, if any, observable between recent and old employés.
   - *b.* How affected when first commencing the work.
   - *c.* Peculiarities, if any, observable in those engaged in different departments or special branches of work.
   - *d.* General and special effects, if any, due to a given occupation on the nervous, muscular, digestive, and absorbent systems, and organs of circulation, respiration, sight and hearing of all classes of employés.
   - *e.* Approximate loss of time from illness traceable to occupation.
   - *f.* Monthly or quarterly fluctuations in number of employés from all causes.
   - *g.* Auxiliary substances used in the manufacture of tobacco, and special processes employed.
   - *h.* Variety of manufactured products, and degree of special skill required in operatives.

Such being an outline of the work in view, it it hoped that close observation and study of the facts, and information which it is hoped will be thus collected, will enable me at some future time to offer results and conclusions on the effects of tobacco handling and working on immature and growing, as well as adult, operatives, that are safely based, and which will have a permanent value to the student of industrial hygiene.



No. of Ward.	No. of Inhabitants per Acre.	Death Rate per 1000 Inhabitants.
1	71	19
2	65	17
3	63	20
4	84	23
5	74	24
6	34	22
7	54	23
8	12	26
9	25	21
10	90	21
11	9	20
12	81	24
13	30	25
14	54	23
15	33	22
16	18	23
17	57	22
18	34	18
19	9	21
20	24	20
21	4	26
22	3	22
23	1	24
24	11	19
25	0.2	20
26	1	21
27	1	15
28	2	21

MAP OF PART

OF THE

CITY OF SAINT LOUIS,

SHOWING THE

DENSITY OF POPULATION

And Death Rate per 1000,

For the year 1883.

Prepared for 12th Annual Meeting A. P. H. A., Oct. 1884.

Scale 2200 ft. per inch.

EXPLANATION.

Outline Figures give Number of Wards.
Blue Figures give Number of Inhabitants per Acre.
Red Figures give Death Rates per 1000 Inhabitants.

Total Population,	383,006.
Total Area,	39,214.6 Acres.
Population per Acre,	9.8
Average Deaths per 1000,	21.35

1	71	19
2	65	17
3	63	20
4	84	23
5	74	34
6	34	22
7	64	23
8	12	28
9	26	21
10	90	31
11	9	30
12	81	24
13	30	26
14	64	23
15	35	22
16	18	23
17	57	22
18	34	18
19	6	21
20	24	20
21	4	26
22	3	22
23	1	24
24	11	19
25	0.2	20
26	1	21
27	1	16
28	2	21

IX.

THE CHIEF LOCAL FACTORS IN THE CAUSATION OF DISEASE AND DEATH.

By ROBERT LUEDEKING, M. D.,

PROFESSOR OF PATHOLOGICAL ANATOMY IN THE ST. LOUIS MEDICAL COLLEGE, AND LATE CLERK ST. LOUIS BOARD OF HEALTH.

One of the most striking peculiarities of the city of St. Louis is the large area over which its population is distributed, so that, according to the census of 1880, the number of persons to the acre was but 8.7, the entire area being nearly 40,000 acres, and the total population being 350,522; and taking the area of the old city limits, we had then a density of but 26.39 to the acre, there being 326,940 residents within an area of 12,386.4 acres. In the year 1883 the density was computed at 9.8 persons to the acre, the greatest density being 90 persons to the acre in the tenth ward, and 0.2 persons to the acre in the twenty-fifth ward.

This is indeed a low density compared with that of most metropolitan cities: that of London, for instance, is given at 52.5 to the acre in 1883. And yet we find the annual rate of mortality per thousand in London in 1883 to have been but 20.4, while that of St. Louis was 21.35. With such a variance existing in the relative densities, and a rate of death in favor of the city of greater density, it must needs force itself upon our conviction that inherent faults in our sanitation must be the cause. On scrutinizing the table of the distribution of our mortality in 1883 by wards (see appended map), we find that the lowest rate of 17 per thousand is found in the second ward, with a density of 65 persons to the acre, and that the highest mortality prevails in the twenty-first ward, being 26 per thousand, with a density of four persons to the acre.

In this twenty-first ward having the highest mortality, we have an area of 1,012 acres; and reference to the sewer and water-pipe map shows that not more than half a dozen blocks are sewered and supplied with water, while, on the other hand, the second ward, 233.8 acres, is perfectly drained and supplied with water; and yet this ward, together with the fourth, tenth, twelfth, and fourteenth wards, contains the greatest number of tenement houses and habitations of the poor. Each and every block of the territory mentioned, however, is supplied with an abundance of water from the municipal water-works, and nearly every house is connected with a district, private, or public sewer. The result is most striking in that the rate of mortality does not exceed the average, in fact is but 21.2, while the density is 75 to the acre. This

very striking contrast demonstrates beyond question the utility of a perfect drainage and water-supply in lowering the mortality of large cities.

An examination of the tables of mortality of the City Health Department, and comparison with the water and sewer map, will show the sanitary disadvantages of the thinly populated districts without sewerage and water-supply, as against the densely populated districts that are well provided for in this regard. Low, marshy ground along the river bank, and some of the western districts that abound in ponds and sink-holes, have high mortalities, and are fit subjects for earnest consideration by the sanitary engineer. The fuller consideration of situation, soil, surroundings, etc., of St. Louis, has however been had in detail in papers preceding this one, and there is a disposition, especially at the present time, to extend our public water-supply, our sewer system, and to improve the quality of our street paving. Undoubtedly our prevailing climatic conditions, showing rapid changes from extremes of heat and cold, have a telling effect upon our mortality and death statistics.

Inasmuch as this paper is to be embodied in the transactions of this association, together with the results of the investigations of my predecessors on more pertinent subjects, it remains for me only to state that a most potent factor in the causation of sickness and death is to be found in the slight efforts put forth by the city of St. Louis in the direction of preventive measures.

The health commissioner, only in the past summer, with cholera prevalent in southern Europe, was by the municipal assembly refused the paltry sum of $15,000 to defray the expenses of a complete house to house investigation of the city. Yet a work of this character has never been done in our city, and once done might have made the basis of preventive operative measures for years to come. A complete sanitary survey of the city could have been so accomplished. As it is, our health department to-day presents the anomaly of being without a corps of sanitary inspectors.

And in many other regards St. Louis has reason to be ashamed of its neglect of precautions and safeguards that every civilized community should observe. Notwithstanding that our milk-supply is notoriously bad, and that adulterations of food are common, there is no provision whatsoever in our charter or ordinances for a chemist, or for a corps of inspectors of milk or meat and other provisions. Our public markets should be specifically regulated by ordinance, and a systematic supervision by a competent officer is imperative.

Another most glaring defect in our legislation is the absence of a law governing plumbing, and providing for competent inspection of our house drainage. In the Eastern cities private corporations undertake to make intelligent and competent inspection, at given intervals, of the plumbing, drainage, heating apparatus, and ventilation of private dwellings for moderate compensation. We in St. Louis do not, so far, enjoy the satisfaction of such a necessary luxury.

Further sanitary measures of a preventive nature, that are poorly pro-

vided for, is our system of street and alley cleaning. Only a pittance is allowed for this most important work. The failure to provide amply no doubt costs many a life. Our method of removal of refuse and garbage, and the removal and disposition of dead animals, should be extended, improved, in fact, entirely changed.

All of these points are intended to convey the fact that in point of public sanitation much must be done in St. Louis.

Our control of cow and other stables, of rendering establishments, and other offensive trades, is insufficient. In fact, the whole *modus operandi* for the abatement of nuisances, even the simple and every-day kind, is too cumbrous and clumsy. If an offender be refractory, it takes a month to remove a *bona fide* abominable nuisance.

The management of contagious diseases is pretty well provided for. At any rate, notification of all cases is demanded; and exclusion of all children, that may convey contagion, from the public schools is practised.

In summing up, I desire, therefore, to state emphatically that the chief factor in the causation of disease and death in St. Louis is the disregard of nearly all those measures that have been so ably and eloquently advovated this week by the members of this association. It is to be hoped that the citizens of St. Louis will become aroused to the incalculable benefits to be derived from the ounce of prevention. No representatives should be chosen to the municipal assembly but such as have learned that all things municipal should be made subservient to that greatest factor in the promotion of welfare, the *public health*.

APPENDIX.

NOTES UPON THE HISTORY OF CHOLERA IN ST. LOUIS.

By ROBERT MOORE, C. E.

The first appearance of cholera in St. Louis was in 1832. According to Dr. Peters (M'Clellan's Hist. of Cholera in U. S., 1873, page 579) it was first brought to Jefferson barracks, a few miles below the city, by soldiers from the United States military post at Rock Island, to which point it had travelled from Quebec by way of the great lakes. The mortality was very great, rising to twenty per day in a population of about 8,000, which is equivalent to nine hundred and seventy-five in the city of to-day. But, as no record of deaths was then kept, the total number cannot be given.

Cholera also appeared here during the next year, being this time imported from New Orleans. The mortality was less than the previous year, but the absence of records makes it impossible to give any exact statements.

EPIDEMIC OF 1849.

The severest visitation of cholera in St. Louis was that of 1849, by which time the population within the city limits had increased to 63,471, as shown by a census taken in February of that year.

The disease had been brought to New Orleans on emigrant ships early in December, 1848, and in a few weeks was carried to all the principal cities on the Ohio and Mississippi rivers. During the last week in December, several boats from New Orleans with cholera on board arrived in St. Louis, one of them being the steamer Amaranth, which arrived on the 28th with no less than thirty cases amongst its passengers and crew.

On January 2, 1849, the steamers Aleck Scott and St. Paul arrived here, having left New Orleans on the 26th ult. The former reported forty-six cases of cholera on the trip, six of them fatal; the latter, twenty-six cases and four deaths. On the 7th, the steamer Gen. Jessup arrived from the same port, having had "many cases" of cholera on her trip, six of them fatal.

Each of these steamers brought many immigrants, who were landed at the wharf with all their baggage, and scattered throughout the city in boarding-houses, without the slightest hindrance or seeming care on the part of the city authorities. It is no surprise, therefore, when, in the morning paper of the 9th, we read that "several cases of cholera were reported in the city yesterday, one or two fatal." The editor adds, however, that they were "caused by cabbage;" and to many of his readers this explanation was perhaps sufficient.

The cholera was now fairly planted, and for the next four years, including the years 1849, 1850, 1851, and 1852, it was never wholly absent from the city, except for three short intervals of about four weeks each.

It did not, however, at once become epidemic. The deaths from cholera in January were thirty-six. In February they were but twenty-one, a decline which led the *Republican* to announce that there was no ground for alarm, there being "no cholera in the city." During the next month, however, in spite of this assurance, the deaths from this cause were seventy-eight, or over double the number of January; and in April there was a still further increase to one hundred and twenty-six.

All this time nothing was done by the city authorities, either to prevent the spread of the disease within this city, or to stop the stream of infection which kept pouring in from New Orleans. For example, the *Republican* of April 12 records the arrival from New Orleans, on the night before, of the steamer Iowa with four hundred and fifty-one deck passengers, mostly English Mormons, and that during the trip there had been nine deaths from cholera. Of course, in view of such facts, the disease could not help spreading, and during the first week in May the deaths from this cause amounted to seventy-eight.

By this time the city had become thoroughly alarmed. The board of health, which consisted of a physician and a committee of the council, by proclamation urged the "disinfection of back yards and damp places with chloride of lime." Even the newspapers now admitted the disease to be on the increase—"perhaps epidemic." The city was also reported to be filled with hundreds of immigrants, besides those *en route* from other states to the gold fields of California.

On the 9th of May, the circuit court adjourned for three weeks on account of the difficulty of getting jurors. Twenty-four new cases of cholera and six deaths are also reported for this day; and the same paper which contains this record notes the arrival of the steamer America, on which there had been twenty-two deaths since her departure from New Orleans. The epidemic was now fairly established, and for the seven days ending May 14, the average number of interments due to this cause was over twenty-six per day.

On the night of May 17 occurred the great fire, in which twenty-three steamboats and many blocks of buildings in the business part of the city were consumed. After the fire, the mortality from cholera fell below twenty per day for a couple of weeks, and a hope sprang up that the epidemic had spent its force and would soon cease. But it was short-lived, for on Saturday, the 9th of June, the deaths from cholera rose again to twenty-six, and on the 10th to thirty-seven. For the week ending June 17 the burials due to this cause were 402, or over fifty-seven per day.

Meantime the importation of fresh cases from New Orleans continued without abatement. On the day last named (June 17) the steamer Sultana arrived with between three hundred and four hundred immigrants. Twenty-five deaths had occurred during her trip, and on arrival she had six dead bodies still on board.

During the next week, ending June 24, the deaths from cholera rose to six hundred and one, or eighty-six per day. By this time the alarm had deepened, until we hear of a popular subscription to clean the streets,

and a patriotic citizen offers twenty dollars' worth of sulphur for purposes of disinfection. On the 25th, a mass meeting was assembled at the court-house, at which the propriety of quarantine was at last suggested, and the authorities strongly denounced for their inaction. A committee of twelve, two from each ward, was appointed to wait upon the city council and urge immediate action. The latter body was not at that time in session, and many of its members had sought places of safety outside the city. By vigorous efforts, however, they were hastily assembled on the afternoon of the next day (June 26), and audience given to the prayer of the committee. By way of answer, an ordinance was passed at the same sitting, and approved by the mayor, Jas. G. Barry, by which the city government was virtually abdicated in favor of the petitioners. The committee of twelve appointed by the mass-meeting of yesterday, composed of T. T. Gantt, R. S. Blennerhasset, A. B. Chambers, Isaac A. Hedges, James Clemens, Jr., J. M. Field, George Collier, L. M. Kennett, Trusten Polk, Lewis Bach, Thomas Gray, and Wm. G. Clarke, were made a "committee of public health" with almost absolute power. Authority was conferred upon them to make all rules, orders, and regulations they should deem necessary, and any violation of their orders was made punishable by fine up to five hundred dollars. This authority was to continue during the epidemic. Vacancies in the committee were to be filled as they themselves should determine, and $50,000 was appropriated for their use.

The committee, thus suddenly clothed with the sole power and responsibility, at once took up their task. At their first meeting, held on Wednesday, June 27, certain school-houses in each ward were designated as hospitals, and physicians appointed to attend them. They also provided for a thorough cleansing of the city, to be begun at once, with an inspector or superintendent for each block. Among these "block inspectors," as they were termed, were many of the best citizens of the city, who entered into the work with the utmost zeal, and declined afterwards to receive any pay.

On the next Saturday, June 30, the committee recommend "the burning, this evening, at 8 o'clock, throughout the city, of stone coal, resinous tar, and sulphur"—a measure which seems to have met with much favor, for in the next day's paper we are told that on the night before "in every direction the air was filled with dense masses of smoke, serving, as we all hope, to dissipate the foul air which has been the cause of so much mortality." The committee also appointed Monday, July 2, to be observed as a day of fasting and prayer—a recommendation with which, as with that for bonfires, there was general compliance.

The committee, however, did not content themselves with prayers and smoke alone. Thus, we are told that on Sunday the block inspectors continued their work of purification without regard to the day, and on the very day of fasting and prayer appointed by themselves, the committee dictated to the city council an ordinance, which was passed the same day, establishing quarantine against steamboats from the South; and the

steamboatmen were at once notified to govern themselves accordingly. On the next day, July 3, a quarantine station was established on the lower end and west side of Arsenal island, with Dr. R. F. Barrett as visiting physician, and the detention of steamers and the unloading of immigrants and their baggage at once begun. On the 10th of July there were over three hundred people at quarantine.

Meantime the mortality kept steadily increasing, until, on the day last mentioned (Tuesday, July 10), two weeks after the appointment of the committee, the total deaths reached the alarming figure of 184, of which 145 were from cholera. After this date, however, the death rate rapidly declined, until on the 31st of July the interments due to cholera were only three. Finally, on the first day of August, the committee of public health, in a proclamation signed by Thos. T. Gantt, chairman, and Samuel Treat, clerk, declared the epidemic to be over, and that there is no longer any danger in visiting the city. At the same time they closed their accounts (having spent $16,000 out of the $50,000 at their disposal), resigned their trust, and adjourned *sine die*.

But whilst no longer epidemic, the disease was not wholly gone, but was a cause of death in each remaining month of the year. The total mortality from this cause for the year is given by Dr. Engelmann at 4,317, or nearly sixty-seven per thousand of the population as given by the census of February. Other accounts give the total cholera deaths for the year as 4,555, or over three hundred greater. The mortality from all causes for this year is given by Dr. Engelmann as 8,495, or nearly one hundred and thirty-four per thousand.

CHOLERA FROM 1850 TO 1854.

During the next year, 1850, cholera was also a cause of death in every one of the twelve months. The total for the year is 883, of which 458 occurred in July—figures which seem small only when compared with the frightful record of the previous year; for the ratio per thousand of 1850 applied to the population of to-day, would give a mortality of over 5,000.

In 1851 the deaths from cholera reached 845. Of these, 505 occurred in June. In three months of this year—February, October, and December—there were no deaths from this cause; but in the next year, 1852, every month claimed its victims, and the total for the year was 802. During these four years, 1849, 1850, 1851, and 1852, cholera was a permanent resident, and by the most conservative report caused the death of 6,847 persons.

During 1853 the disease was wholly absent for the first time since 1848. But in 1854 it again appeared, with renewed vigor, and swept away no less than 1,534 lives, or about twelve per thousand of the population. After this it wholly died out, and gave us no further trouble until it was again imported in 1866.

CHOLERA OF 1866.

The precise route by which cholera reached the city in 1866 is not altogether certain, but it probably came by rail from New York, and not as heretofore by way of the Mississippi river. Its first appearance was in the week ending August 3, during which there were five deaths from this cause. But there had been good reason to expect it for many months. During the autumn of 1865, the governor of the state, Thomas H. Fletcher, had called the attention of Mayor Thomas to the probable coming of cholera during the ensuing year, and suggested the propriety of preparing for it. The mayor heartily endorsed this suggestion, and endeavored to get the city council to take the necessary measures. But his appeal met with no response. In the spring of the following year his efforts to this end were renewed, but with no better result. The council steadily refused to do anything. The cholera was not here, and it was argued that any measures of preparation for it would frighten strangers and injure business: so that when it finally appeared, the city was wholly unprepared to fight it. There was, it is true, a so-called board of health, which, as in 1849, consisted of a committee of the council and a health officer, but they had neither the authority nor the money, even if they had the knowledge, necessary to stamp out a pestilence.

The disease, therefore, spread with great rapidity. During the second week of its presence, it caused 120 deaths. For the third week the number rose to 754; and in the fourth week, ending August 24, it reached 991, or an average of 142 per day.

By this time the need of some vigorous and concerted measures to fight the enemy had become so great that volunteers had once more to come to the rescue. This time, however, the organization took the form of a committee of citizens in each ward, who, acting in concert with the mayor, visited from house to house, furnishing nurses and medicines to those who needed them. During the next week after the work began, the mortality fell to about one half that of the previous week, and steadily declined thereafter, until, for the week ending October 30, the number of deaths was only thirty, and a month later the disease had wholly disappeared.

The total number of deaths due to the epidemic this year was 3,527, although Dr. M'Clellan's report on cholera in the United States in 1873 gives the number of deaths from this cause in St. Louis in 1866 as 8,500 —a statement which has been frequently copied and generally accepted by the newspapers. It so happens, however, that we have two independent enumerations to guide us in this matter—one made by the board of health, the other made after the epidemic was over, by the city assessors, as the result of a house to house inquiry. The total of the latter enumeration falls short of the former; but when we add to it the deaths in the city hospital as given by the books of that institution, we get exactly the same number, 3,527, as given by the board of health, so that the correct-

ness of this figure may be considered as fully established. The rate of mortality which it represents is $17\frac{3}{10}$ per thousand of population.

The location of the deaths in this year, as given by the assessors' reports, with the approximate mortality per thousand for each block, is shown on a map which accompanies this paper. I will not attempt any discussion of the facts revealed by this map, any further than to say that it shows in a very striking manner the close relation between cholera and filth. Those parts of the city where the people and their habitations were clean, and where no wells were used for drinking-water, escaped almost entirely, and the whole force of the epidemic was spent upon those parts where the houses and the people were unclean, and well-water was in most frequent use. Whilst "Kerry patch" and "Frenchtown" show on the map in deep black, Stoddard's addition is almost blank. The man whose food and drink were free from filth would seem to have been as safe in St. Louis in the midst of the epidemic as if he had been a thousand miles away.

CHOLERA SINCE 1866.

In June of the next year, 1867, cholera appeared once more and threatened again to sweep the city. But this time a real board of health, with adequate powers and with Dr. John T. Hodgen at its head, had been organized. It is therefore no surprise that in spite of its earlier start the cholera in 1867 caused but 684 deaths, or less than one fifth of the number of the previous year.

In 1873, when cholera appeared again, it was hardly recognized as such, and the victims, as counted by Dr. M'Clellan from reports of local physicians, numbered only 392.

Whether, on its next appearance here, the death roll shall be numbered by tens or by thousands will depend upon whether the people and their officers are wise enough to profit by the teachings of the past, or shall require to be taught again by the bitter lessons of experience.

APPENDED TABLE SHOWING MORTALITY FROM CHOLERA IN ST. LOUIS.

	1849	1850	1851	1852	1854	1866	1867	1873
January	36	13	2	4	1	.....	.....	.....
February	21	4	.....	3	2	.....	.....	.....
March	78	2	1	1	10	.....	.....	.....
April	126	12	9	2	91	.....	.....	.....
May	554	80	47	44	190	.....	.....	.....
June	1,746	174	505	230	479	.....	6	.....
July	1,689	458	233	274	533	2	8	.....
August	45	59	37	98	136	2,388	103	.....
September	13	16	9	41	55	1,082	321	.....
October	3	21	.....	53	20	51	225	.....
November	3	39	2	31	4	4	20	.....
December	3	5	.....	21	13	.....	1	.....
Total	4,317	883	845	802	1,534	3,527	684	392
Population	63,471	77,860	83,715	90,010	104,060	204,327	212,360	267,620
Rate per 1,000	68.0	11.34	10.10	8.91	14.75	17.26	3.22	1.47

REMARK.—The figures of population for 1849 and 1866 are from enumerations made by the city authorities; those for 1850 are from the U. S. census. For other years the population is computed by compound interest formula, assuming the annual rate of increase from one census to another to be constant.

MAP OF PART
OF THE
CITY OF SAINT LOUIS,
SHOWING THE LOCATION OF
Deaths from Cholera in 1866.
Prepared for 12th Annual Meeting A. P. H. A., Oct. 1884.
Scale 2200 ft. per inch.
DEATH RATE PER 1000 OF POPULATION
IS INDICATED BY ANNEXED SHADINGS
RATE 0-25 PER 1000
" 25-50 " "
" 50-75 " "
" 75-100 " "
" 100-125 " "
" 125-150 " "
" 150-175 " "
" 175-200 " "
" 200-225 " "
" 225-250 " "
RATE 255 PER 1000
" 285 " "
" 333-381 " "
" 400 " "
" 500 " "
" 693 " "
Population 1866, 204,000.
Deaths from Cholera, 3,527.
Deaths from Other Causes, 5,379.
CARONDELET PARK
EAST CARONDELET
ARSENAL ISLAND
CHOUTEAU
MISSISSIPPI
RIVER
TOWER GROVE PARK
FOREST PARK
LAFAYETTE PARK
FAIR GROUND AND ZOOLOGICAL GARDEN
BELLEFONTAINE CEMETERY
CALVARY CEMETERY
O'FALLON PARK
HYDE PARK
ST. LOUIS WATER WORKS
VENICE
KERR'S ISLAND
CITY OF EAST ST. LOUIS
TOWN OF BROOKLYN

STATISTICS

OF

DEATHS FROM CHOLERA

IN

SAINT LOUIS IN 1866.

FROM REPORTS MADE BY COL. R. E. ROMBAUER, STATE AND COUNTY COLLECTOR.

COMPILED BY

ROBERT MOORE, C. E.,

OCTOBER, 1884.

STATISTICS.

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks.			
						North.	South.	East.	West.
3	3	153	19.6	1.34	114.2	Spruce.	Almond.	Front.	First.
4	4	174	23.1	1.47	118.4	Clark.	Spruce.	"	"
12	8	47	171.0	1.35	34.8	Vine.	Locust.	"	"
13	3	42	71.0	1.99	21.1	Washington.	Vine.	"	"
14	7	88	78.9	1.45	60.7	Christy.	Washington.	"	"
15	43	167	258.0	1.48	112.8	Morgan.	Christy.	"	"
16	21	106	198.0	1.63	65.1	Franklin.	Morgan.	"	"
18	5	67	74.6	1.80	37.2	Carr.	Washington.	"	"
22	4	126	31.8	2.43	51.9	Biddle.	Carr.	First.	Second.
24	27	278	97.0	2.85	97.5	Carr.	Franklin.	Waddingham.	"
26	19	137	139.0	1.90	72.1	Morgan.	Christy.	First.	"
27	2	45	44.4	1.89	23.8	Christy.	Washington.	"	"
28	9	209	43.1	2.45	85.3	Washington.	Vine.	"	"
29	1	15	66.7	1.90	7.9	Vine.	Locust.	"	"
32	1	61	16.4	1.84	33.2	Pine.	Chestnut.	"	"
34	4	231	17.3	2.14	108.0	Market.	Walnut.	"	"
35	4	193	20.7	1.77	109.0	Walnut.	Elm.	"	"
36	11	535	20.6	1.82	294.0	Elm.	Clark.	"	"
37	16	263	61.1	1.88	139.9	Clark.	Spruce.	"	"
39	6	254	23.7	1.85	137.3	Almond.	Poplar.	"	"

40	4	169	23.7	1.93	87.6	Poplar.	Plum.	"	"
41	8	555	14.4	3.03	183.2	Plum.	Cedar.	"	"
42	8	83	96.4	2.02	41.1	Cedar.	Gratiot.	"	"
43	12	237	50.7	2.70	87.8	Gratiot.	Lombard.	"	"
44	5	191	26.2	2.62	72.9	Lombard.	Chouteau.	"	"
46	6	195	30.8	3.09	63.1	La Salle.	Convent.	"	"
47	7	508	13.8	3.94	129.0	Convent.	Rutger.	Second.	Third.
48	12	178	67.4	3.89	45.8	Chouteau.	Convent.	"	"
49	8	310	25.8	1.88	164.9	Lombard.	Chouteau.	"	"
50	9	284	31.7	1.90	149.5	Gratiot.	Lombard.	"	"
51	9	241	37.4	1.83	131.7	Cedar.	Gratiot.	"	"
52	18	354	50.9	2.84	124.6	Plum.	Cedar.	"	"
53	4	355	11.3	1.80	197.2	Poplar.	Plum.	"	"
54	16	413	38.7	1.74	237.5	Almond.	Poplar.	"	"
55	7	444	15.8	1.78	249.5	Spruce.	Almond.	"	"
56	6	407	14.8	1.86	219.0	Clark.	Spruce.	"	"
57	6	259	23.2	1.87	138.5	Elm.	Clark.	"	"
58	5	240	20.9	1.81	132.6	Walnut.	Elm.	"	"
59	8	240	33.4	2.21	108.6	Market.	Walnut.	"	"
60	33	223	148.0	1.88	118.6	Chestnut.	Market.	"	"
64	5	128	29.1	1.89	67.7	Vine.	Locust.	"	"
65	2	100	20.0	2.08	48.1	Washington.	Vine.	"	"
66	5	97	51.6	1.81	53.6	Christy.	Washington.	"	"
67	13	204	63.8	1.58	129.1	Morgan.	Christy.	"	"
68	4	102	39.3	1.80	56.7	Franklin.	Morgan.	"	"
69 E.	3	187	16.1	1.58	118.3	. . . . .	. . . . .	. . . . .	. . . . .
69 W.	1	421	2.4	1.64	256.3	Carr.	Franklin.	Second.	Collins.
70 E.	33	157	211.0	1.91	82.2	. . . . .	. . . . .	. . . . .	. . . . .
70 W.	9	347	25.9	2.11	168.3	Carr.	Franklin.	Collins.	Third.
71 E.	1	236	4.24	2.04	115.7	Biddle.	Carr.	Second.	Collins.
71 W.	10	229	43.7	1.90	120.5	Biddle.	Carr.	Collins.	Third.
72 E.	9	386	23.4	1.46	264.0	Ashley.	Biddle.	Second.	Collins.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
72 W.	3	239	12.55	1.48	161.5	Ashley.	Biddle.	Collins.	Third.
73	12	527	22.8	3.88	135.8	Chouteau.	Convent.	Third.	Fourth.
75	10	185	54.1	1.70	108.9	Gratiot.	Lombard.	"	"
76	14	377	37.2	1.91	197.4	Cedar.	Gratiot.	"	"
77	5	167	30.1	2.86	58.4	Plum.	Cedar.	"	"
78	6	215	28.1	1.80	119.4	Poplar.	Plum.	"	"
79	6	342	17.6	1.70	201.2	Almond.	Poplar.	"	"
81	8	300	26.7	1.88	159.5	Clark.	Spruce.	"	"
82	5	317	15.8	1.92	165.1	Elm.	Clark.	"	"
83	3	190	15.8	1.81	105.0	Walnut.	Elm.	"	"
84	10	433	23.1	2.22	195.0	Market.	Walnut.	"	"
85	5	272	18.4	1.84	147.8	Chestnut.	Market.	"	"
90	1	54	18.5	0.83	65.1	Washington.	St. Charles.	"	"
91	4	175	22.9	1.17	149.6	Christy.	Washington.	"	"
92	4	96	41.7	0.89	107.9	Morgan.	Christy.	"	"
93	12	132	90.9	0.88	150.0	Franklin.	Morgan.	"	"
94	8	629	12.7	2.08	302.4	Franklin.	Morgan.	Fourth.	Broadway.
95	13	272	47.8	1.40	194.3	Morgan.	Christy.	"	"
96	8	203	39.5	1.40	145.0	Christy.	Washington.	"	"
97	6	49	123.0	0.92	53.3	Washington.	St. Charles.	"	"
98	4	194	20.7	1.84	105.5	St. Charles.	Locust.	"	"
102	1	6	167.0	1.44	4.2	Chestnut.	Market.	"	"
103	1	123	8.14	1.80	68.3	Market.	Walnut.	"	"

105	1	251	4.0	1.42	176.8	Elm.	Clark.	"	"
106	1	120	8.3	1.41	85.1	Clark.	Spruce.	"	"
107	2	103	19.5	1.15	89.6	Spruce.	Almond.	"	"
109	1	209	4.8	2.42	86.4	Poplar.	Cerre.	"	"
110	2	215	9.31	1.41	152.5	Clarke.	Spruce.	Broadway.	Sixth.
112	1	201	5.0	1.42	141.5	Walnut.	Elm.	"	"
113	3	186	16.2	1.79	103.9	Market.	Walnut.	"	"
114	1	367	2.73	1.44	255.0	Chestnut.	Market.	"	"
115	1	206	4.86	1.44	143.1	Pine.	Chestnut.	"	"
116	1	156	6.42	1.44	108.3	Olive.	Pine.	"	"
118	7	93	75.3	1.74	53.5	St. Charles.	Locust.	"	"
119	7	137	51.1	0.92	148.9	Washington.	St. Charles.	"	"
120	6	60	100.0	1.40	42.9	Christy.	Washington.	"	"
121	2	192	5.2	1.40	137.1	Morgan.	Christy.	"	"
122	10	324	30.9	2.08	155.7	Franklin.	Morgan.	"	"
123	27	449	60.4	2.08	216.0	Franklin.	Morgan.	Sixth.	Seventh.
124	20	328	61.1	1.40	234.0	Morgan.	Christy.	"	"
125	2	430	4.7	1.41	130.6	Christy.	Washington.	"	"
126	2	156	12.8	0.93	167.7	Washington.	St. Charles.	"	"
127	5	215	23.3	1.64	131.1	St. Charles.	Locust.	"	"
128	2	98	20.5	1.41	69.5	Locust.	Olive.	"	"
129	6	339	17.7	1.45	234.0	Olive.	Pine.	"	"
130	1	188	5.32	1.44	130.6	Pine.	Chestnut.	"	"
131	3	235	12.8	1.44	163.2	Chestnut.	Market.	"	"
133	3	204	14.7	1.42	153.9	Walnut.	Elm.	"	"
135	11	345	31.9	1.41	244.7	Clark.	Spruce.	"	"
136	2	25	80.1	0.35	71.4	St. Charles.	Vine.	Third.	Fourth.
137	18	234	76.9	2.73	. .	Wash.	Franklin.	"	Broadway.
138	24	443	54.2	2.18	203.0	Wash.	Franklin.	Broadway.	Sixth.
139	26	666	39.1	2.20	303.0	Wash.	Franklin.	Sixth.	Seventh.
140	4	468	8.6	1.95	240.0	Carr.	Wash.	"	"
141	5	354	14.2	1.95	181.5	Carr.	Wash.	Broadway.	Sixth.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
142	13	550	23.7	1.64	335 5	Carr.	Wash.	Third.	Broadway.
143	3	184	16.3	0.96	191.6	Biddle.	Carr.	"	"
144	5	425	11.8	2.08	204.4	Biddle.	Carr.	Broadway.	Sixth.
145	8	381	21.1	2.08	133.1	Biddle.	Carr.	Sixth.	Seventh.
146	1	352	2.85	2.48	141.9	Spruce.	Poplar.	"	"
148	4	197	20.4	2.49	78.9	Cerre.	Gratiot.	"	"
150 N.	3	39	77.1	0.88	44.3	Papin.	Chouteau.	"	"
150 S.	1	91	11.1	1.12	81.2	Chouteau.	La Salle.	"	"
153	9	440	20.45	2.15	205.0	Hickory.	Rutger.	Broadway.	Sixth.
154	17	616	27.6	4.34	141.9	Convent.	"	Third.	Broadway.
156 S.	7	86	81.4	1.23	699.0	Chouteau.	La Salle.	Broadway.	Sixth.
159	3	98	30.7	2.50	39.2	Gratiot.	Papin.	"	"
160	3	278	10.8	1.79	155.3	Cerre.	Gratiot.	Fourth.	Broadway.
161	9	405	22.2	2.49	162.6	Cerre.	"	Broadway.	Sixth.
162	1	128	7.82	2.49	51.4	Poplar.	Cerre.	"	"
163	3	134	22.4	2.49	53.8	Spruce.	Poplar.	"	"
164	2	228	8.78	0.93	245.0	Washington.	St. Charles.	Seventh.	Eighth.
165	9	435	20.7	1.40	311.0	Christy.	Washington.	"	"
166	18	295	61.1	1.40	210.7	Morgan.	Christy.	"	"
167	21	414	50.8	2.08	199.0	Franklin.	Morgan.	"	"
168	9	440	20.6	2.15	205.0	"	"	Eighth.	Ninth.
169	2	200	10.0	1.40	142.9	Morgan.	Christy.	"	"
170	6	92	65.3	1.40	65.7	Christy.	Washington.	"	"

171	4	157	25.5	0.94	167.0	Washington.	St. Charles.	"	"
		with block 17.							
173	1	352	2.9	1.40	251.4	Christy.	Washington.	Ninth.	Tenth.
174	7	212	33.1	1.45	146.2	Morgan.	Christy.	"	"
175	6	474	12.7	2.07	229.0	Franklin.	Morgan.	"	"
176	13	312	41.7	2.07	154.2	"	"	Tenth.	Eleventh.
177	4	188	21.3	1.45	129.7	Morgan.	Christy.	"	"
179	3	123	24.4	0.93	132.2	Washington.	St. Charles.	"	"
180	4	146	27.4	1.54	94.8	St. Charles.	Locust.	Seventh.	Eighth.
181	2	162	12.4	1.41	114.9	Locust.	Olive.	"	"
182	4	271	14.8	1.45	186.9	Olive.	Pine.	"	"
183	3	244	12.3	1.45	168.3	Pine.	Chestnut.	"	"
185	4	314	12.8	1.80	174.4	Market.	Walnut.	"	"
186	4	286	14.1	2.76	103.6	Walnut.	Clark.	"	"
188	1	208	4.8	2.76	75.4	"	"	Eighth.	Ninth.
189	13	406	32.1	1.79	226.8	Market.	Walnut.	"	"
190	1	328	3.05	1.45	226.2	Chestnut.	Market.	"	"
191	2	202	9.9	1.45	139.3	Pine.	Chestnut.	"	"
194	3	154	19.5	1.43	107.7	St. Charles.	Locust.	"	"
195	2	278	7.2	2.76	100.7	Walnut.	Clark.	Ninth.	Tenth.
196	8	254	31.5	1.77	143.5	Market.	Walnut.	"	"
200	3	164	18.3	2.41	68.0	Rutger.	Park.	Kosciusko.	Second.
202	2	246	8.13	3.07	80.1	"	Block 693.	Second.	Third.
203	2	160	12.5	1.07	149.5	Merchant.	" 692.	Third.	Point.
204	2	169	11.83	1.02	165.7	Rutger.	Merchant.	"	Broadway.
205 N. & S.	8	901	8.9	6.00	150.1	Market.	Clark.	Tenth.	Eleventh.
208 E. & W.	5	787	6.4	6.00	131.1	"	"	Thirteenth.	Fourteenth.
209 E. & W.	4	756	5.3	6.00	. . .	"	"	Fourteenth.	Fifteenth.
210 N.	4	345	11.6	2.77	124.5	"	Walnut.	Fifteenth.	Sixteenth.
211 E. & W.	5	494	10.1	6.00	82.3	"	Clark.	Sixteenth.	Seventeenth.
215 E.	3	511	5.9	1.67	306.0	Spruce.	Poplar.	Twelfth.	Thirteenth.
215 W.	1	388	2.6	1.67	232.3	"	"	Thirteenth.	Fourteenth.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
217	5	302	16.6	2.46	122.8	Clark.	Spruce.	Fourteenth.	Fifteenth.
218	1	183	5.5	2.27	80.6	Spruce.	Poplar.	"	"
219	1	77	13.1	2.27	33.9	"	"	Fifteenth.	Sixteenth.
221	3	132	22.7	4.50	29.3	Clark.	Spruce.	Sixteenth.	Blk. 451 N.
235	1	6	167.0	1.99	3.0	Mound.	Howard.	Front.	First.
240	2	203	9.9	1.87	108.6	"	"	First.	Second.
241	1	173	5.8	2.02	85.6	Howard.	Mullanphy.	"	"
242	4	341	11.7	2.02	168.8	Mullanphy.	Florida.	"	"
243	3	94	32.1	0.93	101.1	Florida.	Cass.	"	"
245	3	57	52.6	0.97	58.8	"	"	Collins.	Broadway.
246	4	187	21.4	2.02	92.6	Mullanphy.	Florida.	Second.	"
247	6	145	41.3	2.01	72.1	Howard.	Mullanphy.	"	"
248	6	200	30.0	1.86	107.5	Mound.	Howard.	"	"
249	2	5	400.0	1.77	2.8	Brooklyn.	Mound.	"	"
251	13	622	20.9	2.08	299.0	Biddle.	Carr.	Seventh.	Eighth.
252	10	540	18.6	1.95	277.0	Carr.	Wash.	"	"
253	21	529	39.7	2.18	242.7	Wash.	Franklin.	"	"
254	15	776	19.3	2.27	342.0	"	"	Eighth.	Ninth.
255	10	747	13.4	2.02	361.3	Carr.	Wash.	"	"
256	3	522	5.8	2.15	243.0	Biddle.	Carr.	"	"
257	7	712	9.8	2.15	331.2	"	"	Ninth.	Tenth.
258	3	265	11.3	2.02	131.2	Carr.	Wash.	"	"
259	6	400	15.0	2.18	183.5	Wash.	Franklin.	"	"

260	14	516	27.1	2.18	236.7	"	"	Tenth.	Eleventh.
261	9	503	17.9	2.02	249.0	Carr.	Wash.	"	"
262	3	534	5.6	2.16	249.2	Biddle.	Carr.	"	"
263	4	382	10.5	1.70	224.8	"	"	Eleventh.	Twelfth.
264	5	466	10.7	1.60	291.3	Carr.	Wash.	"	"
265	19	218	87.2	1.72	126.8	Wash.	Franklin.	"	"
266	12	427	28.1	1.66	257.3	"	"	Twelfth.	High.
268	2	537	3.7	1.63	329.4	Biddle.	Carr.	"	"
269	3	442	6.8	1.59	278.0	"	"	High.	Thirteenth.
270	6	441	13.6	1.49	296.0	Carr.	Wash.	"	"
271	4	318	12.6	1.61	197.5	Wash.	Franklin.	"	"
272	2	130	15.4	1.35	96.3	St. Charles.	Locust.	Ninth.	Tenth.
273	1	169	5.9	1.41	119.9	Locust.	Olive.	"	"
274	1	79	12.7	1.45	54.5	Olive.	Pine.	"	"
275	1	128	7.8	1.45	88.3	Pine.	Chestnut.	"	"
276	2	209	9.6	1.46	143.1	Chestnut.	Market.	"	"
277	1	379	2.6	1.11	341.4	"	"	Tenth.	Eleventh.
282	12	47	255.0	1.28	36.7	O'Fallon.	Ashley	First.	Second.
283	1	97	10.4	1.07	90.7	Dickson.	O'Fallon.	"	"
284	2	209	9.6	1.00	209.0	"	"	Second.	Collins.
286	1	199	9.9	1.44	138.2	O'Fallon.	Ashley.	Collins.	Third.
287	4	172	23.3	1.39	123.7	Dickson.	O'Fallon.	"	Broadway.
290 W.	3	31	96.8	1.00	31.0	Madison.	Chambers.	Commercial.	First.
291 E.	1	2	500.0	1.16	1.7	Clinton.	Madison.	Front.	Commercial.
297	1	141	7.1	1.65	85.4	N. Market.	Monroe.	First.	Second.
308 W.	13	487	26.7	2.80	173.9	Buchanan.	Dock.	Second.	Broadway.
309 W.	5	271	18.4	3.41	79.5	Dock.	Branch.	Broadway.	Ninth.
315	1	140	7.2	1.65	84.9	Warren.	Benton.	Second.	Broadway.
317	3	72	41.7	1.65	43.6	N. Market.	Monroe.	"	"
319	1	51	19.7	1.65	30.9	Clinton.	Madison.	"	"
320	1	82	12.2	1.65	49.7	Madison.	Chambers.	"	"
327	1	127	7.9	1.65	77.0	Monroe.	Clinton.	Broadway.	Ninth.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
328	5	147	34.1	1.65	89.1	N. Market.	Monroe.	Broadway.	Ninth.
329	1	60	16.6	1.65	36.4	Benton.	N. Market.	"	"
330	9	379	23.7	1.65	229.6	Warren.	Benton.	"	"
332	2	65	30.8	1.65	39.4	St. Louis Ave.	Montgomery.	"	"
333	3	132	22.8	1.65	80.0	Wright.	St. Louis.	"	"
336	1	46	21.8	0.93	49.5	Palm.	Wright.	Ninth.	Block 1146.
339	1	233	4.3	1.65	141.2	Montgomery.	Warren.	"	Tenth.
340	2	143	13.9	1.65	86.7	Warren.	Benton.	"	"
342	1	23	43.5	1.65	13.9	N. Market.	Monroe.	"	"
343	7	171	40.9	1.65	103.6	Monroe.	Clinton.	"	"
344	1	190	5.3	1.65	115.2	Clinton.	Madison.	"	"
345	4	190	21.1	1.65	115.2	Madison.	Chambers.	"	"
346	1	201	5.0	1.65	121.8	Chambers.	Tyler.	"	"
350	2	162	12.4	0.82	197.6	Madison.	Chambers.	Tenth.	Eleventh.
355	1	106	9.44	0.82	129.3	Warren.	Benton.	"	"
359	1	38	26.4	1.65	23.0	St. Louis.	Montgomery.	Eleventh.	Twelfth.
361	1	81	12.4	3.99	20.3	Benton.	Monroe.	"	"
366	11	351	31.3	2.59	135.5	Park.	Barry.	Broadway.	Seventh.
367	5	204	24.5	2.07	98.5	Barry.	Marion.	"	"
368	3	233	12.9	2.07	112.6	Marion.	Carroll.	"	"
369	5	214	23.4	2.20	97.3	Carroll.	Soulard.	"	"
370	8	226	35.4	2.07	109.2	Soulard.	Lafayette.	"	"
371	3	128	23.5	2.16	59.3	Lafayette.	Geyer.	"	"

372	5	448	11.2	2.81	159.4	"	"	Seventh.	Eighth.
373	3	198	15.2	2.07	91.4	Soulard.	Lafayette.	"	"
375	2	270	7.4	2.07	130.5	Marion.	Carroll.	"	"
376	4	344	11.6	2.07	166.2	Barry.	Marion.	"	"
377	3	290	10.4	1.89	153.4	Park.	Barry.	"	"
379	4	85	47.1	2.07	41.1	Barry.	Marion.	Eighth.	Ninth.
381	1	257	3.9	2.20	116.8	Carroll.	Soulard.	"	"
382	10	240	41.7	2.07	115.9	Soulard.	Lafayette.	"	"
383	8	245	32.6	3.62	67.7	Lafayette.	Geyer.	"	"
386	1	264	3.8	1.71	154.4	Soulard.	Lafayette.	Ninth.	Tenth.
387	2	154	13.1	1.82	84.6	Carroll.	Soulard.	"	"
388	9	203	44.4	1.71	118.7	Marion.	Carroll.	"	"
389	2	45	44.5	2.25	20.0	Park.	Marion.	"	"
390	1	145	6.9	1.99	72.9	"	"	Tenth.	Menard.
391	1	296	3.4	1.71	173.1	Marion.	Carroll.	"	"
392	1	119	8.4	1.82	65.4	Carroll.	Soulard.	"	"
395	3	271	11.1	0.97	279.4	Emmett.	Geyer.	"	"
398	3	199	15.1	1.71	116.4	Soulard.	Lafayette.	Menard.	Eleventh.
399	7	279	25.0	1.83	152.4	Carroll.	Soulard.	"	"
400	2	246	8.13	1.71	143.7	Marion.	Carroll.	"	"
406 N. & S.	6	315	19.1	2.81	112.1	Emmett.	Geyer.	Eleventh.	State.
407	3	188	16.1	1.71	110.0	"	Calhoun.	Twelfth.	Thirteenth.
412	1	146	6.85	0.87	150.5	Park.	Carroll.	Thirteenth.	Linn.
415	7	71	98 6	0.72	98.6	Lafayette.	Emmett.	"	"
418	1	30	33.3	2.29	13.1	Poplar.	Cerre.	Seventh.	Eighth.
419	4	189	21.2	2.45	77.1	Cerre.	Gratiot.	"	"
420	2	280	7.15	3.76	74.5	Gratiot.	Chouteau.	"	"
421	1	252	3.97	5.72	44.1	"	"	Eighth.	Ninth.
422	4	363	11.1	2.48	146.4	Cerre.	Gratiot.	"	"
425	3	71	42.2	1.57	45.2	Clark.	Spruce.	"	"
429	1	16	62.5	2.48	6.5	Cerre.	Gratiot.	Ninth.	Tenth.
430	2	23	87.1	3.76	6.1	Gratiot.	Chouteau.	"	"

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
432	1	96	10.5	3.00	32.0	Cerre.	Gratiot.	Tenth.	Eleventh.
435	2	21	95.2	2.12	9.9	Clark.	Spruce.	"	"
440	3	46	65.0	2.52	18.3	Gratiot.	Papin.	Twelfth.	Thirteenth.
444	5	274	18.3	6.15	44.6	Poplar.	Randolph.	Fourteenth.	Sixteenth.
448	2	258	7.75	2.32	111.2	Papin.	Chouteau.	"	Block 454 E.
451 N.	1	234	4.28	1.29	181.4	Clark.	Spruce.	Block 221.	Eighteenth.
452 N.	1	40	25.0	1.26	31.8	Mo. Pac. R. R.	Austin.	Seventeenth.	"
459	2	113	17.7	1.53	73.9	Clark.	Spruce.	Eighteenth.	Nineteenth.
460 N.	1	73	13.7	2.06	35.4	Market.	Walnut.	Seventeenth.	Eighteenth.
461	4	178	22.5	4.42	40.3	Chouteau.	Hickory.	Seventh.	Eighth.
462	6	345	17.4	7.55	45.7	"	"	Eighth.	Ninth.
463 E.	9	382	23.6	2.76	138.5	Hickory.	Rutger.	Seventh.	Eighth.
464 E.	17	575	29.5	2.32	247.9	Rutger.	Park.	"	"
465 E.	2	113	17.7	2.53	44.7	Autumn.	"	Ninth.	Tenth.
465 W.	2	157	12.8	1.62	96.9	"	"	Tenth.	Eleventh.
466 E.	2	161	12.5	2.71	59.4	Morrison.	Autumn.	Ninth.	Tenth.
467 E.	1	184	5.44	2.72	67.6	Hickory.	Morrison.	"	"
470	2	291	6.88	4.97	58.5	Chouteau.	Hickory.	Eleventh.	Twelfth.
482 E.	1	45	22.2	4.04	11.1	"	"	Grattan.	Dolman.
483 W.	1	57	17.6	4.00	14.2	Hickory.	Park.	Dolman.	2d Carondelet.
486	1	87	11.5	1.26	69.5	Block 487.	Chouteau.	Eleventh.	Twelfth.
489	1	50	20.0	2.09	23.9	Chestnut.	Market.	"	"
490	5	31	162.0	1.47	21.1	"	"	Twelfth.	Thirteenth.

492	3	290	10.4	1.24	233.9	"	"	Fourteenth.	Fifteenth.
493	1	261	3.8	1.32	197.7	"	"	Fifteenth.	Sixteenth.
495	3	92	32.7	1.19	77.3	"	"	Seventeenth.	Eighteenth.
499	2	131	15.3	1.81	72.4	Pine.	Chestnut.	Fourteenth.	Fifteenth.
500	2	271	7.4	1.79	151.4	"	"	Thirteenth.	Fourteenth.
501	1	178	5.6	1.85	96.2	"	"	Twelfth.	Thirteenth.
502	1	360	2.8	2.33	154.5	"	"	Eleventh.	Twelfth.
503	1	297	3.4	2.32	127.5	Olive.	Pine.	"	"
504	1	212	4.7	1.84	115.2	"	"	Twelfth.	Thirteenth.
507	1	194	5.2	1.92	101.0	"	"	Fifteenth.	Sixteenth.
512	3	94	32.1	2.31	40.7	Lucas Place.	Olive.	"	"
517	3	27	148.0	1.57	17.9	" Ave.	Washington.	Eleventh.	Twelfth.
518	1	64	15.6			Two blocks together.			
519	3	159	18.8	1.20	132.5	Lucas Ave.	Washington.	Twelfth.	Thirteenth.
520	1	291	3.4	1.68	173.2	"	"	Thirteenth.	Fifteenth.
521	4	18	222.0	1.14	15.8	"	"	Fifteenth.	Sixteenth.
522 E. & W.	1	28	35.7	1.33	21.1	"	"	Sixteenth.	Seventeenth.
523	3	44	68.2	0.94	46.8	"	"	Seventeenth.	Eighteenth.
524	47	379	124.0	2.67	141.9	Morgan.	Lucas Ave.	"	"
525	25	419	59.6	2.67	156.9	"	"	Sixteenth.	Seventeenth.
526	12	319	37.6	2.67	119.5	"	"	Fifteenth.	Sixteenth.
527	18	487	36.9	2.67	182.4	"	"	Fourteenth.	Fifteenth.
528	2	504	4.0	2.67	188.7	"	"	Thirteenth.	Fourteenth.
529	7	283	24.7	1.32	214.4	Linden.	"	Twelfth.	Thirteenth.
530	4	281	14.2	1.32	213.0	Morgan.	Linden.	"	"
531	6	308	19.5	1.63	189.0	"	Lucas Ave.	Eleventh.	Twelfth.
532	18	349	51.6	1.61	216.7	Franklin.	Morgan.	"	"
533	5	129	38.7	0.64	202.0	Gay.	"	Twelfth.	High.
534	3	216	13.9	0.64	337.5	Franklin.	Gay.	"	"
535	4	17	236.0	0.58	29.3	"	"	High.	Thirteenth.
536	11	168	65.5	0.58	289.7	Gay.	Morgan.	"	"
537	3	214	14.1	1.26	169.8	"	"	Thirteenth.	Fourteenth.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
538	3	447	6.7	1.26	354.8	Franklin.	Gay.	Thirteenth.	Fourteenth.
539	12	370	32.5	2.17	170.5	"	Morgan.	Fourteenth.	Fifteenth.
540	3	67	44.8	2.17	30.9	"	"	Fifteenth.	Sixteenth.
541	9	285	31.6	2.17	131.3	"	"	Sixteenth.	Seventeenth.
542	9	222	40.5	2.17	102.3	"	"	Seventeenth.	Eighteenth.
543	4	257	15.6	2.85	90.2	Wash.	Franklin.	"	"
544	4	449	8.9	2.85	157.5	"	"	Sixteenth.	Seventeenth.
545	8	557	14.3	2.85	195.5	"	"	Fifteenth.	Sixteenth.
546	3	395	7.6	2.85	138.6	"	"	Fourteenth.	Fifteenth.
547	6	439	13.6	2.37	185.3	"	"	Thirteenth.	Fourteenth.
548	12	405	29.6	2.17	186.6	Carr st.	Wash.	"	"
549	11	191	57.6	1.12	170.5	"	"	Fourteenth.	Atchison Place.
550	1	125	8.9	1.12	111.6	"	"	Selby.	Sixteenth.
551	3	424	7.1	2.64	160.6	"	"	Sixteenth.	Seventeenth.
552	3	554	5.4	2.85	194.4	Biddle.	Carr st.	"	"
553	13	476	27.3	2.85	167.0	"	"	Fifteenth.	Sixteenth.
554	7	306	22.9	2.85	107.4	"	"	Fourteenth.	Fifteenth.
555	4	409	9.8	2.35	174.0	"	"	Thirteenth.	Fourteenth.
556	6	416	14.4	2.17	191.7	O'Fallon.	Biddle.	Third.	Sixth.
557	15	333	45.1	2.37	140.5	"	"	Sixth.	Seventh.
558	25	797	31.4	2.52	316.3	"	"	Seventh.	Eighth.
559	12	759	15.8	2.52	301.1	"	"	Eighth.	Ninth.
560	10	830	12.1	2.52	329.4	"	"	Ninth.	Tenth.

561	9	617	14.6	2.29	269.4	"	"	Tenth.	Eleventh.
562	20	398	50.3	2.04	195.1	"	"	Eleventh.	Twelfth.
563	6	591	10.2	2.03	231.3	"	"	Twelfth.	High.
564	9	570	15.8	3.29	173.8	"	"	Thirteenth.	Fourteenth.
565	6	65	92.4	2.52	25.8	"	"	Fourteenth.	Blair Ave.
566	7	355	19.7	2.52	140.9	"	"	Blair Ave.	Fifteenth.
567	8	421	18.9	2.52	167.1	"	"	Fifteenth.	Sixteenth.
568	3	402	7.47	2.52	159.5	"	"	Sixteenth.	Seventeenth.
569	6	104	57.7	1.78	59.8	Division st.	"	Seventeenth.	Eighteenth.
570	3	95	31.6	1.72	55.2	Block 594.	O'Fallon.	Sixteenth.	Seventeenth.
571	6	224	26.8	1.72	130.2	" 593.	"	Fifteenth.	Sixteenth.
572	33	221	151.0	1.72	128.5	. . . . .	"	Blair Ave.	Fifteenth.
573	9	94	95.8	1.72	54.6	. . . . .	"	Fourteenth.	Blair Ave.
574	2	33	60.7	1.72	19.2	. . . . .	"	Thirteenth.	Fourteenth.
575 E. & W.	2	230	8.7	1.74 0.44	129.2	Block 589.	"	Twelfth.	High st.
576	3	298	10.1	1.39	214.4	. . . . .	"	Eleventh.	Twelfth.
577	5+5	965	10.4	5.32	185.6	. . . . .	"	Tenth.	Eleventh.
578	21+3	818	29.3	5.32	153.8	Cass Ave.	"	Ninth.	Tenth.
579	5+24	800 431	23.6	5.32	231.4	"	"	Eighth.	Ninth.
580	6+14	842	23.8	5.32	158.3	"	"	Seventh.	Eighth.
581	10	996	23.1	5.32	187.8	Block 583 W.	"	Sixth.	Seventh.
583 W.	13			3.19		Cass Ave.	Block 581.	"	"
584	14	Included in block 580.		3.61		"	" 580.	Seventh.	Eighth.
585	24	Included in block 579.		3.61		"	. . . . .	Eighth.	Ninth.
586	3	Included in block 578.		3.61		"	. . . . .	Ninth.	Tenth.
587	5	Included in block 577.		3.61		"	. . . . .	Tenth.	Eleventh.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
588	5	290	17.3	3.57	81.2	Cass Ave.	. . . . .	Eleventh.	Twelfth.
589	5	903	5.54	3.61	250.2	"	. . . . .	Twelfth.	Thirteenth.
590	7	586	12.1	3.61	162.3	"	. . . . .	Thirteenth.	Fourteenth.
591	10	354	28.3	3.60	98.3	"	. . . . .	Fourteenth.	Blair Ave.
592	22	401	54.9	3.61	111.1	"	. . . . .	Blair Ave.	Fifteenth.
593	14	66	213.0	3.62	18.2	"	Block 571.	Fifteenth.	Sixteenth.
594	9	307	29.3	3.60	85.3	"	" 570.	Sixteenth.	Seventeenth.
595	4	108	37.1	2.84	38.0	Mullanphy.	Cass Ave.	"	"
596	1	147	6.8	2.84	51.8	"	"	Fifteenth.	Sixteenth.
597	2	80	25.0	2.84	28.2	"	"	Blair Ave.	Fifteenth.
601	3	44	68.2	2.84	15.5	"	"	Eleventh.	Twelfth.
602	2	93	21.6	2.84	32.7	"	"	Tenth.	Eleventh.
603	2	299	6.7	2.84	105.3	"	"	Ninth.	Tenth.
605	2	156	12.8	2.84	54.9	"	"	Seventh.	Eighth.
608	1	120	8.3	1.86	64.5	Howard.	Mullanphy.	"	"
609	2	109	18.4	1.86	58.6	"	"	Eighth.	Ninth.
610	2	21	95.2	1.86	11.3	"	"	Ninth.	Tenth.
616	1	43	23.3	3.03	14.2	Chambers.	"	Fifteenth.	Sixteenth.
620	1	164	6.11	1.70	96.5	Madison.	Chambers.	"	"
624	1	140	7.15	1.66	84.3	Monroe.	Clinton.	Fourteenth.	Fifteenth.
625	8	221	36.2	1.66	133.1	Clinton.	Madison.	"	"
626	3	349	8.61	1.70	205.3	Madison.	Chambers.	"	"
629	1	170	5.88	2.23	76.2	Chambers.	Block 628.	Thirteenth.	Fourteenth.

630	1	188	5.32	1.68	111.9	Madison.	Chambers.	"	"
631	3	236	12.7	1.66	142.2	Clinton.	Madison.	"	"
632	1	234	4.3	1.66	141.0	Monroe.	Clinton.	"	"
633	6	352	17.1	1.63	215.9	N. Market.	Monroe.	"	"
635	1	124	8.07	1.66	74.7	Warren.	Benton.	"	"
636	1	132	7.57	1.66	79.5	Montgomery.	Warren.	Twelfth.	Thirteenth.
637	1	140	7.15	1.66	84.3	Warren.	Benton.	"	"
638	1	144	6.95	1.66	86.8	Benton.	N. Market.	"	"
641	5	306	16.3	1.66	184.3	Clinton.	Madison.	"	"
642	2	203	9.9	1.66	122.3	Madison.	Chambers.	"	"
645	2	17	118.0	2.10	8.1	Block 644.	Howard.	"	"
648	2	149	13.5	1.10	135.5	Brooklyn.	Mound.	Tenth.	Eleventh.
650	11	226	48.7	1.95	115.9	Mound.	Howard.	Ninth.	Tenth.
651	1	217	4.61	0.99	219.3	Brooklyn.	Mound.	"	"
652	1	195	5.1	0.99	197.0	"	"	Broadway.	Ninth.
			Together with blk. 655.						
653	1	132	7.58	2.00	66.0	Mound.	Howard.	Eighth.	"
656	2	85	23.6	1.22	69.7	Hempstead.	Brooklyn.	Broadway.	Point.
657	1	192	5.21	1.67	115.0	Labeaume.	Hempstead.	"	Ninth.
659	7	444	15.8	2.01	220.9	Geyer Ave.	Allen.	"	Seventh.
661	1	84	12.0	7.68	10.9	Dock st.	Branch.	Front.	First.
662	4	108	37.1	1.58	68.3	Geyer.	Allen.	Seventh.	Eighth.
663	3	461	6.51	2.24	205.7	"	"	Eighth.	Ninth.
666	4	313	12.8	1.90	164.7	"	"	Ninth.	Tenth.
669 E.	1	16	62.5	0.77	20.8	St. Louis Ave.	Montgomery.	Front.	Commercial.
675 E.	22	194	114.0	0.97	200.0	Calhoun.	Geyer.	Twelfth.	Thirteenth.
678	4	55	72.8	2.07	26.6	Allen Ave.	Russell Ave.	Thirteenth.	Dolman.
680	1	46	21.8	1.68	27.4	"	"	Eleventh.	Twelfth.
682	1	16	62.5	1.81	8.8	"	"	Tenth.	Menard.
686	4	39	102.0	1.87	20.9	"	"	Broadway.	Seventh.
687	1	198	5.1	1.87	105.9	Russell Ave.	Ann Ave.	"	"
691	6	530	11.4	1.96	270.4	Rutger st.	Park Ave.	"	"

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
692	4	88	45.5	1.09	80.7	Block 203.	Miller st.	Third.	Broadway.
693	10	185	54.1	1.59	116.3	" 202.	"	Second.	Third.
695	3	123	24.4	1.72	71.5	Miller st.	Barry st.	Kosciusko.	Second.
696	19	368	51.7	2.06	178.6	"	"	Second.	Third.
697	9	287	31.3	2.06	139.3	"	"	Third.	Broadway.
698	14	316	44.4	2.06	153.4	Barry.	Marion.	"	"
699	1	353	2.84	2.06	171.3	"	"	Second.	Third.
701	1	118	8.48	2.70	43.7	Marion.	Carroll.	Kosciusko.	Second.
702	21	379	55.5	2.06	184.0	"	"	Second.	Third.
703	7	373	18.8	2.06	181.0	"	"	Third.	Broadway.
704	7	330	21.3	2.06	160.2	Carroll.	Soulard.	"	"
705	6	383	15.7	2.06	185.9	"	"	Second.	Third.
706	5	79	63.3	3.19	24.8	"	"	Kosciusko.	Second.
708	4	184	21.7	2.06	89.3	Soulard.	Lafayette.	De Kalb.	"
709	4	355	11.3	2.06	172.3	"	"	Second.	Third.
710	6	313	19.2	2.06	151.9	"	"	Third.	Broadway.
711	11	304	36.2	2.06	147.6	Lafayette Ave.	Geyer.	"	"
712	3	464	6.47	2.06	225.2	"	"	Second.	Third.
718	7	506	13.8	2.26	224.0	Geyer.	Lesperance.	Third.	Broadway.
719	1	449	2.23	2.72	165.0	Lesperance.	Russell.	"	"
720	20	214	93.5	2.45	87.3	"	"	Second.	Third.
721	4	189	21.2	2.45	77.1	"	"	De Kalb.	Second.
722	4	340	11.8	2.45	138.8	"	"	Kosciusko.	De Kalb.

726	3	155	19.3	2.16	71.7	Russell.	Trudeau.	De Kalb.	Second.
727	3	20	150.0	2.46	81.3	"	"	Second.	Third.
729	4	301	13.3	1.80	167.2	"	"	Bismarck.	Broadway.
730	11	292	37.7	1.82	160.4	Trudeau.	Duchouquette.	"	"
731	3	119	25.3	1.62	73.4	"	"	Third.	Bismarck.
732	5	217	23.1	2.45	88.6	"	"	Second.	Third.
740 N.	11	110	100.0	1.44	76.4	Duchouquette.	Lami.	"	"
740 S.	2	87	23.1	1.90	45.8	Lami.	Barton.	"	"
741 E.	9	66	136.4	0.96	68.7	Duchouquette.	Lami.	Third.	Bismarck.
744	2	259	7.72	3.84	67.4	Barton.	Victor.	Second.	Third.
745	1	190	5.27	4.52	42.0	"	"	De Kalb.	Second.
746	11	169	65.1	5.22	32.4	"	"	Kosciusko.	De Kalb.
748	2	59	33.9	2.89	20.4	Victor.	Sidney.	Main.	"
749	7	133	52.7	2.20	60.5	"	"	De Kalb.	Second.
752	2	169	11.9	2.25	75.1	"	"	Bismarck.	Broadway.
756	7	241	29.1	2.20	109.5	Sidney.	Anna.	De Kalb.	Second.
759	8	27	36.9	2.20	12.3	Anna st.	Louisa.	"	"
761	1	60	16.6	3.35	17.9	"	Lynch.	Third.	Bismarck.
772	3	17	177.0	1.75	9.7	Lynch.	Dorcas.	Commercial.	Main.
791	2	16	125.0	1.80	8.9	Ann Ave.	Shenandoah.	Tenth.	Menard.
794	5	130	38.5	1.83	71.0	"	"	Broadway.	Seventh.
796	1	9	111.0	2.52	3.6	Shenandoah.	Lami.	Seventh.	Ninth.
798	1	59	26.9	1.80	32.8	"	"	Tenth.	Menard.
820 N.	6	71	84.6	4.12	17.2	Lafayette.	Block 820.	Linn.	Dolman.
824	1	30	33.33	1.75	17.1	St. Charles.	Locust.	Twelfth.	Thirteenth.
830	3	54	55.6	1.29	41.9	Washington.	St. Charles.	Seventeenth.	Eighteenth.
831	1	47	21.3	0.66	71.2	"	"	Robbin's Lane.	Seventeenth.
832	2	81	24.7	1.67	48.5	"	"	Fifteenth.	Robbin's Lane.
833	4	62	64.6	1.17	53.0	"	"	Fourteenth.	Fifteenth.
834	1	12	83.4	1.16	10.3	"	"	Thirteenth.	Fourteenth.
838	6	276	21.8	2.94	93.9	Ann Ave.	Shenandoah.	Seventh.	Ninth.
839	2	12	167.0	1.71	7.0	Barton.	Victor.	Broadway.	Seventh.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
844	6	55	109.0	1.39	39.6	Victor.	Sidney.	Broadway.	Seventh.
845	7	115	60.9	2.38	48.3	Sidney.	Alley.	"	"
851	1	156	6.4	2.77	56.3	Lynch.	Dorcas.	"	"
853	1	72	13.9	2.07	34.8	Plum.	Cedar.	Front.	First.
855	1	43	23.3	2.29	18.8	Gratiot.	Lombard.	"	Main.
857 S.	2	22	91.0	1.79	12.3	La Salle.	Convent.	"	First.
859	1	25	40.0	4.38	5.7	Rutger.	Park Ave.	"	"
860	1	25	40.0	2.46	10.0	Park Ave.	Miller.	"	"
863	4	66	60.6	2.10	31.4	Marion.	Carroll.	"	"
864	2	53	37.8	2.13	24.9	Carroll.	Soulard.	"	"
865	2	30	66.7	2.13	14.1	Soulard.	Lafayette.	"	"
885	2	18	112.0	2.13	8.5	Arsenal st.	Wyoming.	Broadway.	Seventh.
901	1	3	333.0	1.81	1.7	Olive st.	Pine.	Nineteenth.	Twentieth.
913	1	19	52.7	1.26	15.1	Chestnut.	Market.	Twenty-first.	Twenty-second.
918	1	49	20.4	1.22	40.2	St. Charles.	Lucas Place.	Twenty-second.	Twenty-third.
919	1	6	166.7	1.45	4.1	"	"	Twenty-third.	Jefferson Ave.
926	1	33	30.3	2.80	11.8	Pine st.	Chestnut.	Jefferson Ave.	Beaumont.
927	1	196	5.11	3.09	63.4	Olive.	Pine.	"	"
928	1	54	18.5	4.18	12.9	Locust.	Olive.	"	"
930	1	47	21.3	4.83	9.7	Lucas Ave.	Washington.	"	"
931	4	358	11.2	4.51	79.4	Morgan.	Lucas.	"	"
932	1	200	5.0	4.58	43.7	Franklin Ave.	Morgan.	"	"
933	1	217	4.6	2.34	92.7	"	"	Twenty-third.	Jefferson Ave.

934	2	86	23.3	1.56	55.1	Morgan.	Lucas.	"	"
935	3	233	12.9	2.67	87.3	"	"	Twenty-second.	Twenty-third.
936	9	438	20.5	2.67	164.1	Franklin.	Morgan.	"	"
937	2	336	5.95	2.67	125.8	"	"	Twenty-first.	Twenty-second.
938	3	212	14.1	2.67	79.4	Morgan.	Lucas.	"	"
939	1	73	13.7	2.67	27.3	"	"	Twentieth.	Twenty-first.
940	13	329	39.5	2.67	123.2	Franklin.	Morgan.	"	"
942	4	134	29.9	2.67	50.2	Morgan.	Lucas.	Nineteenth.	Twentieth.
943	5	139	36.1	2.67	52.1	"	"	Eighteenth.	Nineteenth.
944	2	204	7.8	2.67	76.4	Franklin.	Morgan.	"	"
945	1	200	5.0	2.85	70.2	Wash.	Franklin.	"	"
947	1	60	16.6	2.63	22.8	Carr.	Wash.	Seventeenth.	Eighteenth.
949	3	126	23.8	2.83	44.5	Biddle.	Carr.	Eighteenth.	Nineteenth.
950	1	142	7.1	2.83	50.2	"	"	Nineteenth.	Twentieth.
951	2	164	12.2	2.63	62.3	Carr.	Wash.	"	"
953	2	320	6.3	2.85	112.3	Wash.	Franklin.	Twentieth.	Twenty-first.
955	4	118	33.9	2.82	41.8	Biddle.	Carr.	"	"
956	2	171	11.7	2.82	60.6	"	"	"	Twenty-second.
957	1	260	3.84	2.63	98.8	Carr.	Wash.	Twenty-first.	"
958	4	323	12.4	2.68	120.5	Wash.	Franklin.	"	"
959	1	50	20.0	2.50	20.0	"	"	Twenty-second.	Twenty-third.
962	2	219	9.52	2.81	77.9	Biddle.	Carr.	Twenty-third.	Twenty-fourth.
963	3	35	85.7	1.50	22.8	"	"	Twenty-fourth.	Jefferson Ave.
964	3	264	11.4	3.53	74.8	Carr.	Wash.	Twenty-third.	"
965	2	146	13.7	3.05	47.9	Wash.	Franklin.	"	"
973	1	34	29.4	1.91	17.8	Sheridan.	Thomas.	Jefferson.	Elliot Ave.
981	1	166	6.02	3.17	52.4	Franklin.	Morgan.	Beaumont.	Leffingwell.
982	1	62	16.1	3.17	19.6	Morgan.	Lucas Ave.	"	"
984	2	34	58.9	3.17	10.7	Washington.	Locust st.	"	"
993	1	68	14.7	3.17	21.5	"	"	Leffingwell Ave.	Ewing Ave.
1039	1	17	58.9	2.03	8.4	Lucas Ave.	Washington.	Compton.	Leonard Ave.
1076	1	24	41.7	2.65	9.1	Dodier.	Wright.	Twenty-fifth.	Parnell.

STATISTICS—*continued.*

Block No.	No. of deaths.	Population.	Rate per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
1080	1	27	37.0	2.78	9.7	Warren.	Benton.	Twenty-fifth.	. . . . .
1098	3	14	214.0	5.26	2.7	Hebert st.	St. Louis.	Twentieth.	Twenty-first.
1101	1	100	10.0	2.86	35.0	Warren.	Benton.	Nineteenth.	Twentieth.
1102	2	7	285.0	3.50	2.0	Montgomery.	Warren.	"	"
1113	1	229	4.4	1.65	138.8	Benton.	N. Market.	Fourteenth.	Fifteenth.
1114	1	196	5.1	1.65	119.1	Warren.	Benton.	"	"
1115	3	212	14.2	1.65	128.5	"	"	Fifteenth.	Sixteenth.
1116	2	220	9.1	1.65	136.4	Montgomery.	Warren.	"	"
1120	3	93	32.2	2.57	36.2	Wright.	St. Louis Ave.	"	"
1121	1	57	17.6	2.30	24.8	"	"	Fourteenth.	Fifteenth.
1123	1	149	6.7	1.65	90.3	St. Louis.	Montgomery.	Thirteenth.	Fourteenth.
1125	1	45	22.3	1.65	27.3	"	"	Twelfth.	Thirteenth.
1130	2	20	100.0	0.66	30.3	Sullivan.	Wright.	Thirteenth.	Fourteenth.
1135	1	93	10.8	2.86	32.5	"	Dodier.	Sixteenth.	Seventeenth.
1136	8	53	151.0	3.80	13.9	Hebert.	Sullivan.	Nineteenth.	Twentieth.
1149	1	9	112.0	2.50	36.0	Eleventh.	Branch.	Point.	Thirteenth.
1157	1	17	58.8	1.74	9.8	Branch.	Palm.	Knapp.	Twentieth.
1165	1	10	100.0	2.68	3.7	Bremen.	Farrar st.	Twentieth.	Twenty-first.
1166	1	69	14.5	2.66	25.9	Farrar st.	Salisbury.	"	"
1170	1	8	125.0	0.05	160.0	Angelrodt.	Branch.	"	Point.
1173	3	94	32.1	2.18	43.1	Mallinckrodt.	Destrehan.	Nineteenth.	Twentieth.
1174	3	127	23.7	2.11	60.0	Salisbury.	Mallinckrodt.	"	"
1178	1	8	125.0	4.89	1.6	St. Louis Ave.	Benton.	Twenty-first.	Rauschenbach.

1180	2	90	22.3	2.25	40.0	Mallinckrodt.	Destrehan.	Blair Ave.	Nineteenth.
1183	1	215	4.7	2.80	76.8	Angelrodt.	Buchanan.	Fourteenth.	Blair Ave.
1185	4	65	61.6	2.74	23.7	Mallinckrodt.	Destrehan.	"	"
1186	1	288	3.5	2.48	116.1	Salisbury.	Mallinckrodt.	"	"
1191	2	151	13.3	1.68	89.9	"	"	Eleventh.	Fourteenth.
1192	11	208	52.9	1.93	107.8	Mallinckrodt.	Destrehan.	"	"
1193	1	60	16.6	2.43	24.7	Destrehan.	Angelrodt.	"	"
1194	1	205	4.9	2.26	90.7	Angelrodt.	Buchanan.	"	"
1195	2	37	54.1	1.98	18.7	"	"	Ninth.	Eleventh.
1196	5	157	31.9	2.13	73.7	"	"	Broadway.	Ninth.
1197	2	127	15.8	1.93	65.8	"	"	Second.	Broadway.
1202	1	21	47.7	3.25	6.5	Destrehan.	Angelrodt.	Broadway.	Ninth.
1204	1	276	3.6	2.40	115.0	Mallinckrodt.	Destrehan.	Ninth.	Eleventh.
1205	12	359	33.5	2.80	128.2	"	"	Broadway.	Ninth.
1206	1	162	6.2	2.48	65.3	"	"	Second.	Broadway.
1214	7	251	27.9	2.24	112.1	Salisbury.	Mallinckrodt.	Broadway.	Ninth.
1216	2	118	16.9	2.89	40.8	Block 1,930.	Salisbury.	Ninth.	Eleventh.
1217	9	325	27.7	3.88	83.8	Farrar st.	"	Broadway.	Ninth.
1227	9	13	693.0	3.96	3.3	Angelica.	Block 1,218.	Ninth.	Eleventh.
1238	1	33	30.3	4.33	7.6	Newhouse.	Bremen Ave.	Nineteenth.	Twentieth.
1270	2	37	54.1	2.22	16.7	Lasalle.	Hickory.	Joab st.	Cardinal.
1275	2	26	77.1	3.27	7.95	Rutger.	Caroline.	Cardinal Ave.	Compton.
1276	1	12	83.3	6.14	1.95	Caroline.	Park Ave.	"	"
1325	2	35	5.7	3.36	10.4	Lafayette.	Geyer Ave.	Waverly Place.	Block 1,324.
1397	1	76	13.2	2.48	30.6	Cushing.	Victor st.	McNair Ave.	Point.
1398	2	82	24.4	0.98	83.7	Gravois Ave.	Cushing st.	"	Devolsey.
1399	4	17	235.0	1.12	15.2	"	"	Devolsey st.	Victor.
1400	3	142	21.1	1.59	8.9	Shenandoah.	Gravois Ave.	McNair Ave.	Devolsey.
1419	1	7	143.0	4.23	1.7	Lynch.	Pestalozzi.	Missouri.	Indiana Ave.
1422	3	31	96.8	4.37	7.1	"	"	Texas.	Ohio Ave.
1533	2	76	26.3	3.69	20.6	Utah.	Cherokee.	Lemp.	Capitol Ave.
1627	2	50	40.0	3.74	13.4	Chippewa.	Keokuk.	Pennsylvania.	Minnesota Ave.

STATISTICS—*concluded.*

Block No.	No. of deaths.	Population.	Ratio per 1,000.	Area in acres.	Population per acre.	Boundaries of City Blocks. North.	South.	East.	West.
1673 E.	3	153	19.6	1.98	77.3	Poplar.	Randolph.	Nineteenth.	Division Line.
1673 W.	2	164	12.2	2.00	82.0	"	"	. . . . .	Alley.
1675	3	82	36.6	1.77	46.3	O'Fallon.	Division.	Seventeenth.	Eighteenth.
1676	2	64	31.3	2.11	30.3	"	"	Eighteenth.	Nineteenth.
1678	8			1.63	1.2	Division.	Biddle.	Nineteenth.	Twentieth.
1682	5	111	45.1	1.63	68.1	"	"	Twenty-first.	Twenty-second.
1683	2	182	11.1	1.63	111.6	O'Fallon.	Division.	"	"
1685	2	125	1.65	1.63	76.7	Division.	Biddle.	Twenty-second.	Twenty-third.
1694	10	199	50.3	1.48	134.5	Walnut.	Clark.	Alley.	Twentieth.
1696	3	112	26.8	2.44	45.9	"	Eugenia.	Twentieth.	Twenty-first.
1697	7	188	37.2	3.32	56.7	Market.	Walnut.	"	"
1708	2	75	26.7	2.73	27.5	Adams.	Randolph.	Twenty-second.	Twenty-third.
1715	2	54	37.1	3.14	17.2	Eugenia.	Clark.	Twenty-third.	Jefferson Ave.
1750	1	5	200.0	1.99	2.5	Wyoming.	Utah.	Broadway.	S. Seventh st.
1780	2	21	95.2	3.98	5.3	Potomac.	President.	Second.	Broadway.
1781	2	39	51.3	1.95	20.0	Zepp st.	Potomac.	"	"
1792	1	35	28.6	1.72	20.4	Block 2,036.	Cherokee.	De Kalb.	Second.
1812	1	24	41.6	3.38	71.0	Hickory.	Rutger.	Jefferson.	Ohio.
1814	1	48	20.9	3.25	14.8	Chouteau.	Lasalle.	"	"
1825	1	8	125.0	0.96	8.3	Caroline.	Alley.	Wilkinson.	Carr Lane Ave.
1830	4	245	16.3	3.59	68.2	Cass Ave.	. . . . .	Seventeenth.	Eighteenth.
1835	1	25	40.0	3.59	6.96	"	. . . . .	Twentieth.	Twenty-first.
1841	1	60	17.0	0.82	73.2	"	. . . . .	Twenty-fifth.	Jefferson.

1860	7	80	87.5	0.85	94.1	Evans Ave.	Easton.	Francis.	Point.
1862	1	100	10.0	3.29	30.4	"	Page.	Grand.	Spring.
1876	1	5	200.0	1.65	3.3	Montgomery.	Block 1,877.	" [S.	Fall Ave.
1884	1	10	100.0	2.08	4.9	Block 1,885.	Cass Ave.	Blk. 1,857 N. &	Grand Ave.
1917	1	36	27.8	2.39	15.1	Palm st.	Hebert st.	Glasgow Ave.	Thompson Av.
1970	1	15	66.6	1.94	7.7	Pestalozzi st.	Crittenden.	McNair Ave.	Missouri Ave.
Barsaloux . . .	3	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
75 C. C. . . .	1	13	76.9	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Allen's Addition .	7	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Harper & Blair. .	6	Near b	lock 76.	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Plat A.	4	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Boyce sub-div. .	1	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Survey 3003 . .	13	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Survey 1,478 . .	3	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Plat F.	3	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Plat L.	1	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Plat T[6]. . . .	1	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Barrett's . . .	1	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Wilkinson Ave. .	2	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Rene Paul sub-div.	2	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Cooper st. . . .	1	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .
Total . . .	3,171	. .	. . .	. .	. .	. . . . .	. . . . .	. . . . .	. . . . .

+ 356 in city hospital, by Superintendent's report.

3,527 grand total, being the same as reported by Board of Health.

THE MANUFACTURE OF SODA-WATER FROM POLLUTED WELL-WATER.

By FRANK R. FRY, A. M., M. D.,

St. Louis.

Several physicians who have their offices in the immediate vicinity of the largest manufactory of soda-water in this city, have for some time known that a large quantity of well-water found its way into the products of this establishment. It was also suspected that the same was true of other establishments in the city.

Knowing the difficulties our local board of health has to contend with in such cases, and thinking to create a wholesome sensation, some data were furnished one of our daily papers, to which they industriously added other facts, and from them printed an article that attracted considerable attention, especially as it appeared during the time last summer when there was most talk and some concern felt about the approach of cholera. The article was valuable, as it developed the fact that all the manufacturers of soda-water in this city excepting one, on their own admission, used well-water in making their products,—in all instances the water being taken from wells in populous portions of the city.

Here I wish to digress long enough to state a few facts about the wells of St. Louis that will help to show the importance of the subject at hand. The number of wells here is not known, but Mr. W. Kennett, of the city sanitary office, states that several years ago, when the police force was ordered to report all the wells throughout the city, over seven thousand were enumerated, and the returns were still not complete. But, with this report as a basis, it is estimated that there are between nine and twelve thousand wells in the city.

Between the dates of July 9th and September 30th, 1884, Dr. John A. Heckelmann, the chemist employed by the city board of health, examined the water of forty of these wells, they being wells that were reported as suspicious, with the following results: "Nine of them contained good water, three usable water, two dangerous, twenty-six unfit for drinking purposes." These results were obtained with a rather variable criterion of good and bad. In determining to which class a well belongs, all of the following points are considered: Color, odor, taste, and transparency of the water, the microscopical examination, the chemical examination, including an estimate of its hardness, the total solids, metals, chlorine, organic matter, sewage, free ammonia,

nitrates and nitrites. Also the location of the well, its proximity to vaults, sewers, etc., the amount of water constantly taken from it, and its depth. But so far as I can discover there is not a fixed limit or definite figure determined in regard to any one of these points, a conclusion being reached from the general showing of the water from each well that is examined.

The gentleman above referred to has expressed an opinion that all the wells in an area extending from Cass avenue on the north to Chouteau avenue on the south, and from the river back to 14th street, are more or less contaminated by sewage. This statement is not meant to imply that some other districts are not just as bad, but it covers the ground in which we are now most interested.

It is not necessary to give details to reveal the importance of this matter, but its enormity (from a sanitary standpoint) will appear by reciting the circumstances of one instance. The establishment where the largest amount of fountain soda is manufactured (probably two thirds or three fourths of all used) in the city is located on 8th and St. Charles streets, in the heart of the city, in a thickly settled block covered with old buildings, destitute of many modern improvements. There are sewers on three sides of the block, and a private one in the alley immediately alongside the establishment. During a large portion of the year this alley is in a filthy condition. The water used is drawn from a well, under the building, thirty-five feet deep. The proprietor freely admitted that he used this water in the manufacture of soda-water, and only regretted that he had not more of it, as the supply was not sufficient, and he was compelled to mix with it more or less of other water. It is a peculiarly significant fact that this very block was described as a cholera centre thirty years ago, and the fact was accounted for by the probable condition of the water in the vicinity.

It is interesting to read in this connection a portion of the report made in 1855 to the American Medical Association by Thomas Reyburn, M. D., "Chairman of the Committee on the Epidemics of Missouri, Iowa, etc." On page 152 of this report he says,—"Among the localities within the city that may be noted as cholera districts, are the first and second wards in the southern section, the 'graveyard' lying between Chouteau's lake and Market street and 9th and 11th streets; Hell's half acre, which was formerly the basin of the lake, located between 5th and 7th streets, Spruce and Chouteau avenue; the block bounded by St. Charles, 8th and 9th streets, and Washington avenue; and a cluster of eight or ten blocks or squares, the centre of which is the intersection of 11th and Morgan streets. In these last two localities the neighborhood is to some extent supplied with wells, excavated in part in the limestone strata underlying the soil, which is here not very deep. The surface drainage has a fair opportunity to percolate the soil and mingle (very imperfectly purified, it may be supposed, by the filtration) with the well-water."

A good look at the block in question would convince one that there has not been much improvement in the surface of it since the above

date. At least a sanitarian could not be convinced that it is safer to drink water from a well on that block now than it was then.

The temptation to use well-water in the manufacture of soda-water is great because of the saving;—first, it saves the expense of filtering and distilling; and secondly, it saves the greater expense of ice for refrigerating purposes, it being necessary to have the water at a low temperature to absorb the requisite amount of carbonic acid gas, to make good soda-water.

My object in presenting this matter to the association is two-fold: first, the custom of using well-water for these purposes may not be confined to St. Louis, and some of the members from other large cities may be led to investigate matters at home; secondly, there seems to be considerable difficulty in handling these cases. While analysis of the water shows impurities, it has not so far shown enough to furnish our board of health a sufficient and safe legal reason to condemn and destroy the wells.

To a body of sanitarians it is not necessary to state that the only safe plan, in instances like these, is to destroy the wells and thereby prevent the possibility of the water being used; but this is not apparent to the manufacturers, or even always to the health authorities. Therefore I have thought that an expression from this association, while it would not be official or mandatory, would be authoritative, and make valuable reference for possible future use in attempting to abate this practice.

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