Leete (J. M.) & Moore (R.)

THE

SANITARY CONDITION OF ST. LOUIS,

WITH

Special Reference to Asiatic Cholera.

REPORTS

TO THE COMMERCIAL CLUB OF ST. LOUIS,

BY

JAMES M. LEETE, M. D.,

AND

ROBERT MOORE, C. E.,

(MEMBERS OF THE CLUB.)

JAN. 10, 1885.

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ST. LOUIS:

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At a meeting of the Commercial Club, January 10th, 1885, the committee, consisting of Dr. J. M. Leete, Chairman, and Messrs. Silas Bent, J. G. Chapman and Robt. Moore, appointed to consider and report upon the sanitary condition of St. Louis, with special reference to Asiatic Cholera, reported through its chairman as follows:

Mr. President and Gentlemen of the Commercial Club—

Your committee, appointed to report on the sanitary condition of the City, with special reference to Asiatic cholera, have decided to lay before you two papers. One, prepared with the concurrence of Drs. J. B. Johnson, Thomas O'Reilly, P. G. Robinson and Gustave Baumgarten, was designed to be such a statement of facts, and conclusions based upon those facts, as would, if laid before the people of St. Louis, convince them that they ought, with the least possible delay, to adopt and enforce such measures as will surely prevent the use of water for drinking, and in the preparation of food, that is poisoned by human excrement and other disease-producing filth; and such other measures as will prevent the storing of human excrement in cesspools, and privy vaults adjacent to dwellings.

The other, prepared by Mr. Robert Moore, though having the same general purpose, gives somewhat more in detail the facts in regard to the propagation of cholera by drinking-water.

ON THE SANITARY CONDITION OF ST. LOUIS.

WITH SPECIAL REFERENCE TO ASIATIC CHOLERA.

By Dr. James M. Leete.

The people of St. Louis should remember that whenever Asiatic Cholera has prevailed in Europe, as it has during several months just past, it has not failed to reach this country and spread through it. This was proven in 1832, again in 1849, again in 1854, and for the fourth time in 1866. Judging from experience, then, cholera will certainly make its appearance in this city in the near future. It will be brought to us, as it has been heretofore, by immigrants, and travelers, and in defiance of any quaratine regulations that have been, or can be enforced. This disease is communicated indirectly by one person to another. The poison, or germ, that causes cholera, is contained in the discharges from the stomach and bowels.

In a city like ours, this most fatal disease is spread chiefly by means of privy vaults, and the water of wells and cisterns. Cholera discharges are cast into privy vaults, and by percolation, the water of wells and cisterns receives the cholera germ. To drink water defiled by cholera discharges, is to invite a disease that generally destroys half, or more than half, of all whom it attacks.

The people of St. Louis are called upon to decide whether Asiatic cholera shall again become a widely spread and destructive epidemic in their city or not. Surely they have not forgotten the cholera of 1866. If they desire a repetition of that year's bitter experiences, they should do nothing until it shall be too late to do anything as it ought to be done. The stubborn pursuit of such a policy by those in authority in this city when Asiatic cholera threatened us in 1866 cost St. Louis 3527 lives, and an almost complete deprivation of trade during three months. Cities that properly valued pure water and cleanliness, and whose preparations in anticipation of cholera where made in accordance with the best that was known in respect of controlling the disease, suffered vastly less. Brooklyn, N. Y., with a much larger population than St. Louis, lost

only 517 by cholera in 1866. New York City, with a population nearly *four times* as large as that of St. Louis, lost only 1158 by cholera in 1866. Glasgow, Scotland, with a population of 425,000, lost only 68 by cholera in 1866. The city water used in Brooklyn and New York City was good, and the authorities, taking time by the forelock, destroyed or removed accumulated filth that would most notably favor the spread of cholera, and prevented, as far as possible, the use of water from the small number of wells and cisterns in those cities. Glasgow, Scotland, had pure water from Loch Katrine for the use of all her people in 1866, and lost by cholera only 68 out of a population of 425,000; while in 1854, having a considerably smaller population, whose conditions of life were about the same as in 1866, except that their drinking water was notoriously impure, being polluted with excremental and sewage filth, she lost 3886 by cholera; and in 1849, having a still smaller population, and the same foul drinking water, she lost 3772 by cholera. In London, in 1849, the greatest suffering by cholera was along the Wandsworth road. On the eastern side of this road, the attack was of such virulence, that in a short time there was not a house in which there was not at least one dead of cholera, and in some houses there was not one person living, and the dead were actually left to "bury their dead." Those living on the opposite side of the road suffered from cholera *scarcely at all.* This fact led people to think that some local cause had much to do with the disease. Upon investigation, they found that the houses on the two sides of the road were supplied with water by two different water companies, and they began to blame the water. Pushing their investigations further, they found on the eastern side, where the cholera had destroyed so many lives, that the pipes that should have conveyed water solely for the cleansing of closets, allowed human excrement and other filth to regurgitate, and poison the water that they constantly used for drinking and other domestic purposes. In this fouling of water with human excrement, the cholera on the eastern side of the road had its origin. The same causes not operating on the western side of the road, the people who lived on that side suffered from cholera *scarcely at all.*

During the epidemic of cholera in London in 1853–54, a district containing 24,854 houses, and a population of 166,906, that were supplied with wholesome water, lost only 611 by cholera. Another district, containing 39,726 houses, and a population of 268,171 that drank water which upon examination was described as "dirty," lost 3,476 by cholera. The conditions of life in these two districts were as nearly as possible identical, except as to the drinking-water. In one district the

people drank water that was tolerably wholesome; in the other they drank "dirty" water, and suffered accordingly.

In 1867 New York City, with nearly 800,000 population, lost only 27 by cholera. In 1867 St. Louis, with about 200,000 population, lost 684 by cholera. During the late epidemic of Asiatic cholera in Genoa (Italy), of 300 people attacked in one district, 275 died. Upon investigation it was ascertained that the drinking-water that those poor people had habitually used was exceedingly foul. Since 1849 a great mass of evidence has been collected which clearly proves that drinking-water that has been fouled with human excrement is the most efficient means of spreading cholera; and next to it in efficiency, stand the vile places in which human excrement is stored, viz., cesspools and privy vaults.

If, then, the people of St. Louis desire, in the interests of human life and commercial prosperity, to control the spread of cholera in their city, according to the best that is known in respect of controlling it, they ought to press upon those in authority the importance of –

1. Filling and permanently closing all wells within the limits of our city water-service.
2. Prohibiting the use of water from cisterns, within the same limits, for drinking and cooking purposes.
3. Abolishing privy vaults as commonly found within the limits of our sewer service, and requiring in their stead privies of such dimensions and construction that excremental filth cannot accumulate in them.
4. Cleaning and keeping clean all blind alleys and obscure corners that are habitually used for the deposit of human excrement.

The above-named work should be begun with the least possible delay, and as rapidly as possible be pushed to completion. Hand in hand with it should go an intelligent and altogether liberal use of disinfectants where most required.

IS ST. LOUIS PREPARED FOR A VISIT OF ASIATIC CHOLERA?

BY MR. ROBERT MOORE.

GENTLEMEN:—Before proceeding to the consideration of the question, How is St. Louis prepared for the expected visit of Asiatic Cholera? which you have given to your committee for investigation, it will be well, first of all, to state as briefly as possible a few of the most important conclusions which the students of cholera have reached in regard to the origin of the disease and the conditions of its propagation. This done, we shall be in a position to answer intelligently whether or not these conditions exist here, and to what extent.

The studies of the phenomena of cholera by men in all parts of the world, during the last fifty years, have resulted in their practically unanimous agreement in the following propositions:

FIRST. Cholera is not originated spontaneously, but is the product of a previously existing germ, which is carried from place to place. Mere dirt, therefore, without the imported germ, will not originate cholera any more than it will a crop of wheat.

SECOND. The primary seat and nursery of this germ is found in the contents of the stomach and bowels of a cholera patient, and the spread of the disease is in all cases due to the conveyance of particles of this poison to the mouths of other persons. Cholera is pre-eminently a disease due to excremental filth.

THIRD. The conveyance of the infective matter from one person to another may take place in several ways, of which the most important are the following:

DIRECT TRANSMISSION.

1. It may be done directly, as where one makes immediate use of the clothing or bedding of a cholera patient, or after handling infected articles, eats with unwashed hands. This method of transmission is favored by poverty and overcrowding, which often necessitate the very dangerous practice of preparing and eating food in the same room with the sick. It accounts, also, for the spread of cholera on emigrant ships, where isolation and cleanliness are, as a rule, impossible.

TRANSMISSION THROUGH THE AIR.

2. The poison may be carried for short distances through the air.

This method of conveyance is the most probable explanation of many cases in which cholera has been spread by unpacking soiled clothing, in some cases after it had been carried thousands of miles. It is quite possible, however, that in these cases the disease germs were conveyed to the mouth directly, or by the hands, rather than by simply breathing the contaminated air.

The cases which most certainly establish this method of transmission are those in which cholera has been traced to the use of filthy privies. A notable instance of this sort occured in Zurich, where, in 1867, there was an outbreak of cholera in the large machinery works of Messrs. Escher, Wyss & Co. After about thirty of the workmen had been attacked, it was discovered that they had all used one particular privy. This being immediately closed, no further attack occurred in the works.

Another case of this kind occurred in 1849, in the Baltimore almshouse, where a large number of the inmates on the side of the buildings exposed to the air from some overflowing cesspools into which cholera dejecta had been cast were attacked with cholera and ninety-nine died, whilst on the other side of the buildings there were hardly any cases. In one building *all* the occupants of one floor, which was specially exposed to these effluvia, died, whilst all the other inmates escaped entirely.*

The mere breathing of the same air as that of a cholera patient is, however, probably not attended with any danger. Experience in India has shown that the nurses and physicians in cholera hospitals are no more subject to cholera themselves than persons who have not been in contact with the disease.† In this sense the disease is not contagious.

TRANSMISSION BY WATER.

3. But the chief means by which the disease is carried, is by the use of water which has been polluted by cholera dejections.

This method of conveyance has been established in such a multitude of cases that an examination of them renders doubt impossible. Some of the most notable and carefully registered instances have occurred in England.

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* Report of Dr. Jas. Wynne, on Cholera in the United States in 1849 and 1850, pages 70-74. Other instances may be found in the Sixth Report of the Rivers Pollution Commissioners of 1868—pages 145-147.

† See "Report on Sanitary Measures in India in 1880-81." London, 1882, page 84.

In London the water supply is furnished by eight private companies, five of whom, in 1849, took their water from the Thames in front of the city, where it is a tidal stream and greatly contaminated with sewage. The effects of drinking this water during the cholera epidemic of that year are given by the Rivers Pollution Commissioners in these words:*

"The portion of the metropolitan population which was supplied by water taken from the Thames at Kew [the highest up the river] suffered fatally from cholera to the extent of 8 in 10,000. Of every 10,000 people supplied with water taken from the river at Hammersmith, 17 died. Of the inhabitants of Belgravia, St. Georges, Hanover Square, Chelsea and Westminster, supplied with water taken below Chelsea Hospital, 47 in 10,000 died; whilst the districts drawing their supply still lower down, viz., at Battersea, and between Hungerford and Waterloo Bridges, where the river was still more foul, suffered to the extent of 163 deaths to 10,000 inhabitants." In other words, the rate of mortality was in direct proportion to the degree of pollution of the water supply.

Between 1849 and 1854, one of two companies which supplied the south side of London, viz., the Lambeth Company, moved its source of supply up the river to Teddington, where the water is comparatively pure, whilst the other company, the Southwark, kept its intake at Chelsea. As the result, the mortality per 1,000 amongst those using the fouler water was $3\frac{1}{2}$ times as great as amongst those using the purer water, the conditions of life amongst those using the two waters being in all other respects exactly the same.†

The experience of Glasgow was to the same effect. Up to 1859 the water used by the city was taken from the Clyde, a highly polluted stream. After that date the source of supply was changed to Loch Katrine, the water from which is almost absolutely pure. The result is seen in the fact that the mortality from cholera, which in 1832, 1849 and 1854 had been 140, 106 and 119 respectively in 10,000 of population, figures from three to five times as great as the corresponding ones for London, fell in 1866 to $1\frac{6}{10}$ per 10,000, a rate so small as to be utterly insignificant, except as it shows that the disease was there and ready to spread, had the former conditions been also present.

But the propagation of cholera by means of water has been shown even more conclusively in cases where the water has been taken, not from the pipes of a public supply, but from polluted wells.

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*See Sixth Report River Pollution Commissioners of 1868, page 142.

† See report of Dr. John Simon, May 1st, 1856, "On the last two Cholera Epidemics of London as affected by Impure Water."

One of the most noted instances of this kind is found in London, where in 1854 a violent outbreak of cholera in a crowded district just east of Regent street and south of Oxford street, was traced to the use of water from a certain well, known as the "Broad Street Pump." It was here shown as the result of very thorough investigation, that the dejections of a fatal case of cholera were thrown into a leaky drain which ran within three feet of the well; and that immediately thereafter in the population using water from this well, cholera broke out with great intensity, so that within a month the number of fatal cases in this limited district was no less than 609. It was further shown that with rare exceptions, those within this district, who for any reason did not use this water, were free from cholera, whilst there were a number of deaths amongst persons outside of the district who had the water of this pump brought to them on account of its fancied superiority. Amongst seventy men employed in a brewery in Broad street, near the pump, but who did not use its water, there was no cholera; whilst the workmen on some new buildings immediately adjoining the brewery who did use the pump water, lost from cholera no less than seven out of thirty-five.

In Hope street, Salford, a suburb of Manchester, where in 1849 there was a sudden and violent outbreak of cholera, there were sixty houses which took their water from wells believed to be unpolluted or from the waterworks, whilst the remaining thirty were dependent upon a shallow well which received the drainage from an obstructed sewer which passed within nine inches of the edge of it, and was believed to have been further polluted by water in which the bedding of two persons who had died of cholera had been washed. Amongst those using the water of this well, there were 26 attacks of cholera and 25 deaths; a rate of mortality almost without precedent, whilst amongst those in the other sixty houses there was not even a single attack.*

Paisley, Scotland, which in all previous epidemics had been very sharply visited, in 1866 lost from cholera but seven lives, the cause of the difference being that in the former years the water supply was taken from wells, whilst in the latter the health authorities had caused all wells to be entirely shut up.

In like manner in the same year in Brooklyn, N.Y., an outbreak of cholera in a district which took its water from a certain famous pump on Van Brunt street was promptly checked by the removal of the pump handle.†

* Report of Dr. Sutherland to the General Board of Health, page 14.

† See paper by Dr. C. F. Chandler, in Transactions American Public Health Association, vol. I, page 541.

MEANS OF PREVENTION.

From facts like these, which if it were necessary, could be multiplied indefinitely, we see, that as a safeguard against cholera, the one thing to be looked after is not the cleaning of streets and alleys, but the prompt and complete removal of excremental filth, so that it may not pollute the air nor poison our drinking water. It is not, and perhaps never will be, practicable to prevent the importation of cholera into any city which lies in the highway of commerce. It has never failed hitherto to break through any quarantine short of absolute non-intercourse. Just so, it is impossible in any city to wholly prevent the occurrence of fires. But, as in the latter case, if we build of brick and stone, it is always possible to confine a fire to the house in which it originates, so in the former, by removing the materials by which cholera spreads, it is not only possible, but very easy to stamp out the disease wherever it appears. A perfect system of sewerage thoroughly utilized, snd a supply of pure water put into every house, and used to the exclusion of everything else, will hereafter render our cities cholera-proof. And even now, an epidemic of cholera cannot be regarded as anything but a city's disgrace.

CONDITION OF ST. LOUIS.

In view of all this, what shall we say of the condition of St. Louis? are we, or are we not, prepared for a visitation of cholera?

In answer to this it would, of course, be pleasant to dwell, as we are much in the habit of doing, upon the unquestionable facts of our admirable drainage, both natural and artificial; upon the excellent quality of our public water supply, whose freedom from hurtful impurity is almost absolute, and upon the very low figure of our annual death rate, which, after all possible deductions, show St. Louis to be normally one of the healthiest of cities. And if we looked only at these things, it would be easy to persuade ourselves that we are in no special danger, and need do nothing, but calmly await the future, in the comforting assurance that whatever happens, it will not be our fault.

We can rest in this opinion, however, only by closing our eyes to certain other facts, which it is our duty now to search out and bring to light.

Amongst these, one of the most important is the fact that notwithstanding our admirable sewerage, constructed at a cost of millions, to

carry off the waste products of human life, we have still in existence within our city limits from 25,000 to 30,000 privies, so constructed as to retain the whole or the greater part of these products to pollute the soil, poison the air, and endanger the lives of those who use them. Even where they have been connected with the sewers they are, in the great majority of cases, but little, if any, better than they were before. They are still essentially unclean, and in time of cholera uncleanness is a sin for which the punishment is too often death.

But while this is bad, worse yet remains behind. Notwithstanding our waterworks have put pure water within the reach of nearly all, there are in the city, and in use to day, from 6,000 to 8,000 surface wells. Large uumbers of these wells are located in the most crowded parts of the city, and nearly all are in close proximity to the privies—a combination for the spread of cholera by far the most pefect which the wit of man has yet devised.*

To see with what deadly effect this agency operates in St. Louis, we have only to consult our own past record in this matter, as compared with that of other cities.† Looking at this, we find that in 1849 the mortality from cholera in St. Louis was over ten times as great as in London in the same year, and over five times as great as in Glasgow, which was then at its worst, and where the density and poverty of the population and the general conditions of life were in other respects almost infinitely worse than they were with us.

Even in 1868, when the mortality here was but 17 per 1,000 as compared with 68 in 1849, it was still over five times that of London, and over 100 times that of Glasgow, where, without greatly mitigating the other conditions of life, they had taken the precaution to purify their drinking-water. Even our own cities of New York and Brooklyn, lying at the very gateway by which cholera was let in upon us, suffered in 1866 to the extent of only 1 4-10 and 1 5-10 per 1,000 respectively, or less than 1-10 of the mortality in St. Louis.

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* Cases like the one cited by Gen. Stevenson in the discussion (page 15), show that in St. Louis the wells are specially subject to pollution.

Capt. Silas Bent relates that an old spring on his father's estate just north of the Arsenal was ruined by drainage from Anheuser's brewery, 2,600 feet distant. In 1873, a well sunk twenty feet into the rock not far from this spring, for the use of employes of the Tudor Iron Works, became the focus for a local outbreak of cholera, which was stopped by closing the well. [See McLellan's History of Cholera in 1873, page 243.]

This peculiar liability to contamination is due, no doubt, to the same features in the underlying rock formation which produced the many sink-holes which dot the city's surface.

† See table of mortality at end of this paper.

But when we learn that the number of wells per 1,000 of population is 100 times as great here as in Brooklyn, and further, that they had the wisdom to close many of their wells, whilst we burnt tar barrels in the streets and left all of our wells open, our only wonder is that the difference in the two death rates was not greater than it actually was.

To the question, then, with which we set out, we must return an answer most decidedly in the negative. St. Louis is not prepared for a visitation of Asiatic cholera—or rather we are prepared for it in the same sense that a city built wholly of wood is prepared for an outbreak of fire. It is, indeed, doubtful whether our condition to receive cholera is any better than it was in 1866. True, we have many more miles of water-pipes and of sewers, but we have also more cesspools and more wells. With very rare exceptions, wells that were open then are open now, and many new ones have been sunk. More than this, the crowding of the population in the poorer quarters of the city is no doubt greater now than it was then. So that if the cholera were to come now, its old feeding grounds in Kerry Patch and Frenchtown would in all probability yield as rich a harvest as they did in 1866.

PRACTICAL MEASURES.

The practical conclusions from all this are very obvious. Two of the more important may be stated, thus:

1. Within the district supplied with water-pipe, all wells should be at once and forever closed by filling them up. Aside from the special invitation which they offer to cholera, wells in a crowded city are always unsafe. They are the main sources of typhoid fever, dysentery, and other diseases, and are a standing menace to the public health. In this conclusion all authorities agree. The recent conferences of State Boards of Health at Washington, in their recommendations to cities of steps to be taken in anticipation of cholera, whose coming they consider almost certain, place first of all the absolute closing of all surface wells. And the city of Brooklyn, under the lead of its very sagacious Commissioner of Health, has already gone so far in this direction that a recent report shows the total number of wells in the city to be but 108, of which all but 16 have been formally condemned.

Outside of the water-pipe district the wells should be subjected to a most rigid inspection, and all which are contaminated, or greatly exposed thereto, should be closed, or the sources of contamination removed.

2. Within the district provided with sewers all privy vaults should be abolished and water closets substituted, or, where this cannot be done, they should be so reconstructed as to make the accumulation or retention of fecal matter impossible.

Where the sewers are not accessible nothing should be allowed but earth closets, or shallow vaults so constructed as to be water-tight, and rigidly guarded from any outside drainage.

In carying out the foregoing policy, special attention should be directed to those parts of the city where the population is most dense, and where cholera has chiefly prevailed in times past. In these, no water, under any pretext, should be tolerated but that from the City Waterworks, and its supply to tenement houses should be compulsory. It might also be well to place on the streets a limited number of free public hydrants. In time of cholera it would certainly be cheaper to give the people water for nothing than to let them drink from wells. There should also be a thorough cleaning up in such places of accumulated filth, and the premises should be so reconstructed and policed as to make such accumulations hereafter impossible.

All this will, of course, require much more work. which should be begun at once. Not very much can be accomplished, however, without additional legislation which shall make the methods of procedure against wells and cesspools more summary than they are at present.

And to this end there is needed, more than anything else, the formation of a widespread public sentiment, which shall not only demand the passage of the necessary ordinances, but, after their passage, shall support the authorities in carrying them into effect.

For we may rest assured that those interested in the continuance of the present order of things, whether from pecuniary motives or simply from habit, will fight hard against any change. The customs of a lifetime are not easily changed, and, no matter how the law may read, its officers will be powerless unless they are sustained by public sentiment.

Towards the formation and diffusion of such a sentiment in behalf of the measures just indicated the action of this Club and of all intelligent men should be now specially directed. For, if the systems of sewerage and water-supply upon which the city has expended so many millions can once be fully utilized to the utter abandonment of the obsolete methods which these systems were intended to supersede, cholera will be shorn of its terrors, and St. Louis can look forward to its coming with as much equanimity as any city in the world.

TABLE OF MORTALITY FROM CHOLERA IN ST. LOUIS.

	1849.	1850.	1851.	1852.	1854.	1866.	1867.	1873.
Population.....	63,471	77,860	83,715	90,010	104,060	204,327	212,360	267,620
Total Deaths.....	4,317	833	845	802	1,534	3,527	684	392
Deaths per 1,000...	68.00	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 on the assumption that the annual rate of increase is constant from one census to another.

MORTALITY FROM CHOLERA IN OTHER CITIES.

	1849.		1854.		1866.		1867.	
	Total Deaths	Rate per 1,000.	Total Deaths	Rate per 1,000.	Total Deaths	Rate per 1,000.	Total Deaths	Rate per 1,000.
London.....	14,137	6.18	10,738	4.29	5,596	1.84	.....	.....
Glasgow.....	3,772	10.6	3,886	11.9	68	.16	.....	.....
Paris.....	.....	.....	.....	.....	5,509	3.02	.....	.....
New York.....	5,071	11.3	.....	.....	1,210	1.37	27	.03
Brooklyn.....	.....	.....	.....	.....	517	1.53	.....	.....
Boston.....	633	4.82	.....	.....	.....	.....	.....	.....
Philadelphia.....	1,022	3.09	.....	.....	.....	.....	.....	.....
Buffalo.....	858	21.74	.....	.....	.....	.....	.....	.....
Chicago.....	678	24.03	.....	.....	.....	.....	.....	.....
Cincinnati.....	4,114	39.04	.....	.....	.....	.....	.....	.....
New Orleans.....	3,501	30.47	.....	.....	.....	.....	.....	.....

DISCUSSION.

After the reading of the foregoing papers, their subject matter was discussed by the invited guests and members of the club. Some of the facts elicited are here given:

Mr. Geo. E. Leighton stated that the value of a pure drinking-water as a protection from cholera was very clearly shown during the last summer in Italy. The disease passed from Marseilles and Toulon through Italy, and in Genoa and Naples became epidemic; whilst Nice, Cannes, Mentone, Monaco and Rome, in all of which the water supply is exceptionally pure, escaped with only a few cases or none at all.

He was of the opinion, that in the interest of public health, owners of tenement houses should be compelled to put in hydrants and provide for their tenants an ample water supply.

Gen. John D. Stevenson, Health Commissioner, in proof of the extreme ease with which wells become contaminated in St. Louis, stated that in the northern part of the city, during the last year, some copperas thrown into a filthy pond, known as "Hogan's Quarry," made its appearance in the wells around it for a distance of two blocks, and that when shortly afterwards the pond was filled with earth, the rising of the water in the pond caused a corresponding rise in all the neighboring wells, showing that they were but extensions of the pond. All wells within reach of the city water service should be closed.

Dr. Thomas O'Reilly gave a number of interesting facts from his own experience in regard to cholera, and a sketch of the history of the disease in India and Europe prior to 1832. He also laid much stress upon over-crowded and unclean tenements as promoters of this disease.

Dr. G. Baumgarten spoke of the extent to which the soil in cities is polluted, so that the ground water, which is collected in wells, must of necessity be impure and unfit for use. Aside from their agency in spreading cholera, wells in cities should be closed at all times.

Col. Henry Flad, President of the Board of Public Improvements, believed that the number of wells in the city was about 7,000. An actual enumeration in sixty-seven blocks, fully supplied with water-pipe, showed that out of a total of 1,928 houses 1,124, or over 58 per cent, took their water from wells, the water from which was nearly always polluted.

An examination of twenty-four wells in Jackson street in 1879, showed the average amount of chlorine to be $14\frac{7}{10}$ grains per gallon, reaching in one case 37 grains. According to the English authorities, 3 grains per gallon render the water "suspicious," whilst 6 grains make it unsafe for domestic use.

He estimated the number of privies at 30,000, of which 20,000 probably are located so that they might be connected with the sewers, though they are not. These should all be cleaned out and reconstructed so as to make any accumulation of fecal matter impossible, a work which could be done at a cost of about $65 each, including the laying of pipe and connecting with the sewer. The cost of filling wells he estimated at $7.50 each.

At the conclusion of the discussion the committee named below was appointed to urge upon the Municipal Assembly, the passage of ordinances embodying the recommendations of the foregoing reports.

COMMITTEE.

J. G. Chapman, Chairman.

Henry Haarstick,
D. K. Ferguson,
E. A. Hitchcock,
Geo. E. Leighton,
Jno. K. Lionberger,
W. H. Pulsifer,
Silas Bent,
E. O. Stanard,
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