WHAT DO YOU DRINK

Pure Water or Diluted Bacteria and Microbes?

OUR PUBLIC WATER SUPPLY

Comprehensive Discussion by the Eminent Hydraulic Engineer, W. R. Coats, of Kalamazoo.

There is perhaps no question before the American people today—and it involves all the peoples of the entire human race—of such transcendent interest and importance as is the question of public water supply.

The well-being, comfort, health and life of the human race is more closely identified with and involved in the quality of the water used in our domestic economy than in any other, perhaps all other causes combined.

I speak here in a general sense relative to "public water supply," as only in this sense has the engineer very much to do with the subject practically. Yet I wish to treat the subject fully and comprehensively in both its public and private bearings. I wish it understood also that the question of "public drainage" is included as a part of my subject.

Public drainage is made much more necessary, indeed almost compulsory, by the introduction of public water supply, but public drainage is not possible without the aid of a "public water supply;" so that the two questions naturally and properly go together, and should be treated under one head.

I believe that more ill health, sickness and death results from bad water supply and bad drainage than from all other causes combined. Disease germs abound in a thousand fold greater proportion in the water we drink than in the air we breath, and are far more dangerous taken into the system with the water than with the air. I very much doubt whether disease germs are primarily produced in the atmosphere at all, but these germs are doubtless taken up by the atmosphere, from the water, and thus conveyed into the human system in the air we breathe.

Development of Bacteria.

In low, marshy districts, where the waters are always loaded with decaying vegetable and animal matter, with all conditions in the highest degree favorable to the development of "bacteria," the most minute microscopic disease organisms known, the atmosphere is very much of the time densely loaded with fog and moisture. In absorbing this moisture from the stagnant, sleeping waters, doubtless vast numbers of these minute disease germs are also absorbed, so that in such localities both elements, the water and the atmosphere, unite in their attack upon the health and lives of all who live in such districts. Hence, the world over, we find such districts the most unhealthy. In the temperate zone, where frost arrests fermentation and decay for several months each year, the diseases produced by this agency assumes comparatively mild forms. But in the tropics, and especially among the dense populations of Hindoostan, where this ferment, decay and developing process is forever at work, the result is frightful. Here all the terrible plagues that have afflicted the human race since the dawn of creation, are fomented and start out on their tour of world-wide devastation. When a plague starts out on its tour of devastation from its Asiatic birthplace, all the people in its pathway become panic-stricken with fear; indeed thousands dying from fear alone. It is at once accepted as true, by the mass, that the moment a case of "plague or cholera" appears in a place the entire atmosphere is tainted and everyone in danger. I believe the truth to be that a case of cholera cannot be communicated through the atmosphere, except possibly in hot, filthy localities where the atmosphere is usually dense with moisture, and even then perhaps only when the disease is largely prevalent.

I think that cool, calm, critical evidence shows that personal contact is necessary. That the germs of the disease must be taken into the system before the disease itself can be produced.

Strangely enough the last place from which this terrible enemy is looked for is the direction of its almost invariable approach, namely, through the medium of our drinking water.

Water the Home for Germs.

Water is the natural developing place and home of all these disease germs, and water is among the first and most necessary elements of human existence, and yet the average human being is more careless concerning the quality of water he uses than about anything else in his daily life; that which most vitally concerns his well being he, through his ignorance, gives slightest attention to. If we can so educate the public that all things can be seen and understood in their true light and bearings, then, and not till then, will the question of "public water supply" receive the attention and treatment its great public importance calls for.

The term, "public water supply," is generally understood as applying to cities, villages, and other large communal aggregations, where a general system is designed to provide for the wants of the entire community. But if we confine ourselves to this view, we leave entirely out of the consideration by far the greater part of all the people.

Except in a very few of our larger cities, for the greater portion of even our urban populations, obtain their water supply from private sources, almost invariably the ordinary private well, this source being almost universal among all rural populations. The waters of the ordinary private wells are the most impure and dangerous waters that we can use. All the more dangerous because of the almost universal belief in their purity and excellence.

In this city, Lansing, in Jackson, Kalamazoo, and indeed in every city in the state, except Detroit, more people patronize the deadly private well, than patronize the "Public Supply," no matter how excellent the latter may be. Jackson, with 25,000 people, and a public water supply and water works inaugurated twenty-three years ago, today only supplies about 8,000 of its people with water from the public source, leaving 17,000 still wedded to the poisoned water of their private wells.

Kalamazoo, with about the same population, and with one of the finest and most excellent public water supplies in the world, yet supplies less than half her people from the public source, all the rest taking their supply from the poisoned wells. The chief reason why the people are so slow to discard their private wells, and adopt the public supply, arises from the fact that the almost universal belief seems to be that the ordinary private well furnishes the purest and best water that can be obtained from any source. Another weighty reason may be found in the fact that most of our public water supply developments are so crude and imperfect and our public water works plants so inefficient and unsatisfactory in service that the people very largely prefer to keep in the old channels. In proof of the soundness of this latter view, we may refer to the two cities of Kalamazoo and Ypsilanti. Kalamazoo, with a perfect water supply, so far as quality goes; and a water works system inaugurated twenty-four years ago, has today only 1,809 service connections with her public water mains, representing only about 9,000 of her 22,000 people. Ypsilanti, with a water supply of similar quality and a water works plant inaugurated only three years ago, has today over 900 service connections, representing more than 4,500 of her 6,000 people as using the public supply. This shows that the quality of the public water service is more important in the public estimation than is the quality of the public water, and that it is well nigh impossible to bring the people into full and general patronage of a public service of such low grade as furnished by water works of the Kalamazoo type, namely, the "variable direct pressure service." And at least nine-tenths of the water works of the entire country are of this objectionable type.

Educate the Public.

The only way to change this order of things and put this all-important question of "Public Water Supply," upon a proper footing, will be to educate the people up to a proper knowledge of what a proper public water supply is and means. Not only must the general public be educated up to a truer knowledge relative to the quality of the water used, and the vital interests involved, but practical workers—often only pretenders—must be educated up to a higher conception of the "mechanics and engineering" involved.

One of the greatest obstacles we will encounter in this educational crusade, will be the popular faith in the purity of our private well water supplies. To overturn this popular faith will prove a herculean task; all the more so, from this wonderful truth. This faith is primarily correct and well founded. It is only through the fault of the mechanics and engineering involved that all the mischief and danger arises. The prime source of the water supply of our private wells will furnish the purest and best water obtainable from any possible source; it is only in the mode of development and utilization that we are all wrong. Nature's process of filtration in the strata of mother earth is far superior to anything man has ever yet discovered, or probably ever will discover.

In taking our water supply from the ground, we must take it from comparatively near the surface, as if we go very deep we usually find the water so highly impregnated with mineral matter as to be unfit for use. On the other hand, we must never take it from above the danger line of surface contamination. In all cases where the rainfall penetrates the earth and percolates through its strata, these waters, in their downward passage, become contaminated by largely absorbing the impurities of the atmosphere, and, all the vegetable and animal filth encountered, so that we will almost invariably find the upper level of the first subterranean water stratum contaminated with organic matter. But right here comes in "nature's" grand saving clause. It is found that in these fixed and permanent subterranean water strata the water never becomes contaminated to but very slight depth by organic matter, all this matter being arrested and held in suspension at or near the surface of the water stratum, very much as oil or other lighter substances is held at the surface, so that to obtain good, pure water, all that is necessary is to go below this thin upper stratum of bad water, and yet not so deeply as to encounter the mineral impregnations below.

In this way every private or public well in the land may be made perfectly safe if located in a water-bearing strata of adequate thickness or depth. As now constructed, nearly all these wells only very slightly penetrate the water stratum, simply skimming their supply from the extreme surface of these waters, thus, of course, getting the cream of all these contaminations.

Organic Gases.

The fact that these organic gases, which poison the waters of our private wells, do not affect the taste, looks or smell of these waters, unless present in very gross form, renders it all the more difficult to convince the average observer that such water is dangerous. It is the prevalent belief of most people that the water of their own wells is exceptionally excellent. As they draw up the "old oaken bucket" and take a draught of the cool, sparkling water from it, it is natural to revert, with grateful feelings, to the beautiful sentiment that inspired the poet in the production of that old poem; but place a sample of this same beautiful water under the glass of a powerful microscope, and what you will see there will speedily banish all romance and sentiment.

Our cess-pools and privy vaults and defective drains are the most dangerous sources of contamination for our wells. The disease germs produced in such places are the most dangerous that can be taken into the human system; and if the drainage reaches the water of our wells these germs will surely be taken into the system.

The popular belief that 30, 50 or 100 feet of intervening earth between our cess-pools and wells furnishes ample protection is entirely fallacious. A little plain, homely, practical truth will go much farther in dispelling this illusion than will whole volumes of theory and metaphor. This was very clearly illustrated in the experience of the city of Ypsilanti in developing her public water supply and drainage systems. While planning and constructing these works I tried in every way to impress upon the minds of the people the danger lurking in waters of their private wells and the necessity of connecting with the public supply. Very few could be made to believe that the water of their wells was bad, the prevalent belief being that these waters were exceptionally good. Least of all could they believe that there was any danger of contamination from their cess-pools or privy vaults. In constructing a sewer through the finest residence portion of the city it was found necessary to go a few feet deeper than these wells with this sewer trench. In a very few days every well within two blocks—750 feet—of this sewer trench was drained dry. After this it was not difficult for these people to see and believe that when the water of their wells could so quickly find its way to this sewer ditch, through 750 feet of intervening earth, certainly the fluid contents of their cess-pools, seldom fifty feet away, could very easily reach their wells. Had these private wells penetrated the water stratum ten feet deeper, and with impervious sides, only admitting water at the bottom, all danger would have been escaped. It will dismiss the subject of private wells with this observation. If the instructions outlined above are followed, every private well may be made perfectly safe.

A Public Water Supply.

To go back to the main subject, "Public Water Supply," while we find nothing involved very different in principle, yet we find the question far more difficult of treatment. In a private supply we usually have only the limited requirements of individual cases to provide for. In a public supply we have the collective whole on our hands.

In almost all localities we can very easily find water enough in the ground to supply a private family of five or ten persons; but when we come to a public supply involving the needs of 5,000 or 500,000 people, it seems a very different problem, and yet it is different only in relative proportion, and it is rarely that we find the obstacles to success insurmountable.

Many of our cities are today poisoning their people through the agency of corrupt public water supplies, developed in partial or total disregard of all natural law and principle. Many other cities with water supplies ample in quantity and perfect in quality often wantonly corrupt these perfect supplies with notoriously bad water upon every little fancied emergency and thus keep the health and lives of their people in constant danger. The city of Jackson, with a most excellent public supply of three million gallons of water per day, while her average consumption is only half this amount, yet turns the water of a foul disease germ laden stream into the water mains and service pipes of all her people, perhaps fifty or one hundred times a year, or as often as they have a fire. The only necessity for this terrible and inexcusable mismanagement is entirely due to the low grade of mechanics and engineering, as exhibited in the development and arrangement of the Jackson water works system.

Honest Public Officials.

It is doubtless true that the great majority of our officials on boards of public works are honest men, and aim to serve the people faithfully. The chief trouble arises from the people themselves electing persons to serve upon such boards who have had no experience whatever in life to qualify them for the work they are called upon to perform. A man may be a good shoemaker, merchant, lawyer, doctor or minister, but the chances are that none of these are in the slightest degree acquainted with the mechanics and engineering involved in a "public works" development. Occasionally some of the least competent of these classes are put in positions of authority upon such boards, and assuming to know more than the best and most experienced, will work worlds of mischief, leaving the poor, dear, foolish people to bear the burden and foot the bills.

Doubtless the most striking instance of inefficiency, gross mismanagement and reckless waste of almost matchless natural advantages is afforded by my home city—Kalamazoo—in the management of her public water works system. I should prefer not to use this case in illustration, could the same end be accomplished and the same good be done otherwise, because everything connected with the Kalamazoo case is in some degree personal to myself. But it is only the public good that I desire to promote, and this means the Kalamazoo public good as well as the general public good. In a case like this the plain, unvarnished truth constitutes what may be called "heroic treatment," and such treatment is the only possible way to reach such cases, and do any good.

Kalamazoo has one of the finest public water supplies in the known world, and yet this water supply is so managed as to be oft-times well-nigh worthless.

Kalamazoo's Water System.

Twenty-two years ago I developed this water supply for the, then village, of Kalamazoo. This supply is taken from the ground, by means of a large well 20 feet in diameter and 30 feet deep. This is the first large public supply ever developed in this manner. Neither the engineering profession or the public had any faith in the feasibility of the work at that time, and it was only after I guaranteed its engineering success and advanced half its cost from my own pocket, that the village authorities permitted me to go forward with the enterprise. The result of this experiment far exceeded our most sanguine expectations. When our work was completed we had a well that would furnish 3,500,000 gallons of water per day, and the quality of the water was perfect. This marvelous well will still, after twenty-two hours constant use, furnish three and one-half million gallons per day of the same fine quality of water, and yet the management of this splendid water supply is so bungled that the city is kept almost constantly on the danger line of a water famine and the people in an almost constant panic of fear.

What a comment upon municipal mismanagement! A city with a water supply of 175 gallons per capita per day for her entire population and supplying only two-fifths of her people, and yet in almost constant fear of a water famine, and to provide for such emergencies makes provision to admit the water of a sewage-polluted stream, thereby poisoning the entire water supply and endangering the lives of all her people.

London, Liverpool and other great cities of Europe find that twenty-seven to thirty-five gallons per capita per day will amply provide for all the needs of their people, and this when all the people get water from the public source. Yet little Kalamazoo, with a supply of 175 gallons per capita per day, cannot safely take care of one-half her people. Comment is unnecessary.

The whole secret of this miserable situation is simply this: Kalamazoo—and all like systems—in their water works management simply live from "hand-to-mouth," with no possible provisions for emergencies. While she has at command at all times 3,500,000 gallons of water per day, she cannot at any time go in excess of this rate for a single half hour. Yet she has placed herself in a position where she is liable to be called upon any hour for water at the rate of at least 7,000,000 gallons per day, while she cannot possibly furnish but the rate of half this amount. As an engineer, I maintain that it is criminal to assume such liabilities without making adequate provision to meet them.

The Reservoir System.

To make this safe provision at Kalamazoo is exceedingly easy; and while this improvement would make everything safe, and in the highest degree efficient in every branch of the public and private service, it would at the same time greatly reduce the cost to the taxpayers.

At Kalamazoo, with a water supply of 3,500,000 per day and a pumping capacity of 6,000,000, it is not possible to exceed the 3,500,000 rate for even a single half hour for any or all service. With a storage reserve, such as the natural advantages at Kalamazoo will afford at the minimum of cost, water at the rate of ten or twelve million gallons per day could be always at command so long as any emergency calling for an excess is ever likely to last, and under such arrangement every branch of the service will be incomparably superior to what it is possible to make it now, and all danger of water famines will forever disappear.

The city of Ypsilanti affords a perfect illustration of the truth of all this, and every feature there has been fully and completely demonstrated in practical use. Ypsilanti has an excellent public supply of 2,000,000 gallons of water per day. She has only one-fourth the population Kalamazoo, yet in three years' time she has 100 per cent more water takers, in proportion to population, than has Kalamazoo at the end of twenty-four years, and her use of water is in excess in the same proportion. Ypsilanti has a maximum pumping capacity of only 2,000,000, gallons per day, yet at any time, and all the time, whether the pumps are running or idle, Ypsilanti has always at command water at the rate of 8,000,000 gallons per day, for any and every emergency, for so long a time as such emergency is ever likely to last. Every gallon of this water is always under 100 pounds pressure to the square inch, at pump-station, and is thus available at any and all time for the highest and best effect in every branch of the public and private service. These works have reached a self-sustaining basis in three years from date of completion.

Pressure in the Mains.

In the Kalamazoo and Jackson systems the water pressure in the mains never exceeds an average of thirty pounds unless especially called for and worked up after the alarm is given. This low pressure is never efficient or satisfactory in any branch of the service. In these works if the pumps stop a single moment, at any time, the entire service in every branch is instantly dead until the pumps start again. In the Ypsilanti type of works, the pumps may stop at any time for six or eight hours in every twenty-four, and yet every branch of the service goes on precisely as if the pumps were running. Indeed, this is precisely what does happen every day at Ypsilanti. At night the pumps are always shut down and the entire pumping power transferred to the electric dynamos, and thus runs the street lights of the city.

The Ypsilanti type of "public water supply" as far surpasses the Kalamazoo and Jackson types in economy as in efficiency. The Ypsilanti system, with its perfect service, reaches a paying basis in three years. Kalamazoo and Jackson, with not better than a fifth-rate service, are still, at the end of twenty-three years, $30,000 behind each year.

These cases ought to convincingly show how very important and necessary it is to adopt correct principles in the planning, construction and management of our public works, and especially as relates to "public water supply." Ypsilanti, at the end of three years, is directly supplying 75 per cent of her entire population with water from the public works and everyone is satisfied with the service in every branch. In Kalamazoo and Jackson, after twenty-three years, only 35 per cent of the people are supplied from the public source, and very few of these are satisfied with the service. These cases ought to clearly show the importance and necessity of good engineering and good management in this field of public work. That satisfactory results are not otherwise possible, I have freely used the three above-named cases in illustration, because I am perfectly acquainted with every detail in each of those cases, and I believe the public interest demands this information, and that it is the clear duty of the engineer possessing it, to furnish it. In the main, all the defective points cited in the Kalamazoo and Jackson cases will apply to every works in the country of that type, and it is the duty of every true engineer to do his utmost in eradicating these defects.

Public Drainage.

I believe it to be of the highest importance, and among our first duties, to provide efficient house drainage everywhere in city, in village and in the country. Surface, or storm drainage, and house drainage, should always be kept separate and distinct. A house drain and storm drain combined is a monstrous blunder, and brings endless danger. The true object and office of a house drain should simply consist in the quick conveyance of all the filth produced in and about the house safely beyond the danger limits.

All house filth is comparatively harmless in its fresh state, and if disposed of before fermentation and putrification takes place, nearly all danger is averted. But if we allow this filth to accumulate in cesspools, privy vaults and other places about our dwellings, we simply leave the doors wide open and invite danger and disease.

If we permit this filth to accumulate and be stored about our premises and to be in constant process of ferment and putrifaction we are establishing the conditions that will most effectually poison the air we breathe and the water we drink, and at the same time preserve, reproduce and perpetuate the disease germs given off by every case of sickness and death ever occurring on these premises.

Had the filth of these premises been properly disposed of in time, then no later occupants of these premises will ever be in any danger beyond their own individual responsibility.

Both public water supply and public drainage are vital public necessities, but we cannot establish effective drainage without the aid of public water supply.

I believe this to be true in our situation today, that all that is necessary to secure the highest effectiveness and most widely beneficial results in both these grand fields of public work throughout our entire country, is to educate the public up to a true knowledge and understanding of the situation and its requirements.

W. R. COATS.

One in seven of all deaths come from Consumption. Thats about the proportion. And almost every death from Consumption comes from neglect and delay. There's respite in preventing the disease—delay in curing it.

You can prevent it—and more so, if you'll act in time, with Dr. Pierce's Golden Medical Discovery. Poor and impure blood makes you an easy victim—a receptive, indifferent host to the system invitation.

You must reach the disease through the blood, and the "Discovery" does it. It's the most potent and effective blood-cleanser, strength-restorer, and flesh-builder that's known to medical science. The scrofulous affections of the lungs that's called Consumption, and every form of scrofula and blood trouble, all yield to it. For Weak Lungs, Spitting of Blood, Bronchitis, Asthma, and all severe, lingering Coughs, it's an unequaled remedy.

And it's the only one that's guaranteed to do what is claimed for it. If it fails to benefit or cure, you have your money back.

SHE PROVES IT.

And the Proof Is Just What Our Readers Want.

Of How It Began She Hasn't the Slightest Idea.

But Concerning Its Ending She Is Explicit and Exact.

We never know just how a thing begins.

But we are always certain of the results which are left.

These reflections were called out by the fact that it is so easy to drift into anything. In this world we must keep our eyes about us or we shall constantly find ourselves drifting into trouble.

We call to mind an instance in which a most estimable lady unconsciously and without knowing when or how, allowed herself to drift in what became to her a most serious matter and caused many years of anxiety and suffering.

This lady is widely known—Mrs. Mary Jane Foster of 327 West Twenty-first, New York city, and what she says are true and exact facts, as can be easily and readily ascertained by anyone. If experience is of any use, here is certainly a revelation to be heeded by all.

Without knowing their meaning she had a dull feeling head, headaches, dizziness, bad taste in the mouth, especially mornings. Her sleep was broken and she would wake mornings feeling tired and exhausted. After a time the appetite became irregular, there was a fullness or bloated feeling after meals, risings of gas, sour stomach, biliousness and constipation—such symptoms, in fact as people frequently experience during the spring of the year.

MRS. MARY JANE FOSTER.

"Why," she said, "for years after I suffered from the worst form of dyspepsia, with gas and fermentation of food, and terrible spasms that seemed to start at the stomach and rise to the head.

"Even the lightest food caused great pain and distress after eating, and I also suffered with great exhaustion, dizziness of the head and weakness of the limbs so that I could scarcely stand on my feet.

"But I am now completely cured by the use of Dr. Greene's Nervura blood and nerve remedy, and I take pleasure in giving my experience to the public in order that other sufferers may be cured as I have been."

Look out for such troubles in the beginning. Now, in the spring, when everybody is certain to be more or less out of order and needs a spring medicine, take Dr. Greene's Nervura blood and nerve remedy immediately, for it is the best and surest of all spring medicines. It will invigorate the blood, strengthen the nerves and give you perfect digestion and regular action of liver, kidneys and bowels. All druggists keep it for $1, and it is purely vegetable and harmless.

It is the great remedy recommended by doctors for spring debility and diseases because it is the discovery and prescription of the well-known physician, Dr. Greene, of No. 35 West Fourteenth street, New York, the successful specialist in curing nervous and chronic diseases. The doctor can be consulted without charge by anyone, either at his office or by writing to him.

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When my baby was three months old his cheeks and forehead began to break out with white pimples on red surface. In a few days itching commenced, which was terrible. After he would rub it, matter would come from the points. In a short time it spread over the top of his head, then scabs soon formed on head and face. We used everything we could hear of for nearly five months. It grew worse all the time. I saw your advertisement of the Cuticura Remedies in the "Chicago Weekly." We purchased Cuticura Remedies and commenced their use. In three weeks' time there was not a sore or pimple, not even a scar, on head or face. He is nineteen months old now, and has no signs of the disease. His scalp is healthy and he has a beautiful head of hair. (See portrait herewith.)

MRS. OSCAR JAMES, Woodston, Kan.

My infant, eighteen months old, was afflicted with skin eruptions on his hips. Bad sores came on other parts. All remedies failed until I procured Cuticura. Cured a year and no return of disease.

MRS. A. M. WALKER, Carnesville, Ga.

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