

# Pollution Menace to Our Drinking Water

*Hygiene*

By JANE STAFFORD

The water supply of our country is threatened. Pollution, a danger worse than flood or drought, menaces it. Refuse, acids, tons and tons of solid matter, all teeming with millions of disease germs, the discharges from factory and home, are dumped into lakes and rivers, there to kill the fish and ruin the water for further use.

The danger is not apparent to the average citizen, who now glibly turns on the faucet and gets a drink of fresh, clear, germ-free water. He does not know that he cannot go on doing that indefinitely unless steps are taken soon to meet and conquer this growing menace which threatens one of the mainstays of his existence. But sanitary engineers throughout the country are alive to the danger and are scheming and working to safeguard the supply of precious water which Mr. Average Citizen uses so lavishly and so heedlessly.

At present the industrial waste of 85 per cent. of the population of the country goes into our streams and lakes without any treatment of any kind, either to neutralize the acids or to dissolve the solid matter or to kill the bacteria, according to Abel Wolman, chief engineer of the Maryland State Board of Health. The time is not far distant when the streams of the country will become so polluted that they cannot be used for sources of water supply. Untreated domestic



THE PUBLIC DEMAND for outdoor recreation is helping in the fight against stream pollution

of the sad state of our waterways. No longer can he hope to catch his breakfast from the stream by which he makes his evening camp, because the heavy pollution of the streams is killing off the fish. Neither can he safely use the stream for his drinking water. It is so turbid and dirty looking that he does not even care to bathe or swim in it.

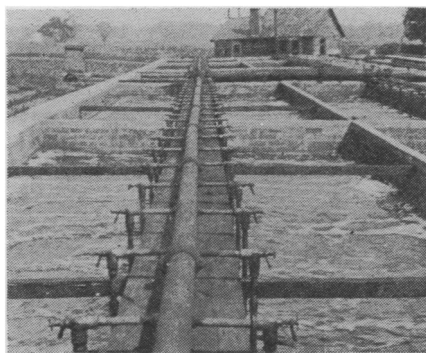
In the coal country, acid iron waste from both active and inactive mines pollutes the stream, killing all forms of life, discoloring the soil of stream bed and bank, and preventing the growth of plants or animals. In factory districts acid and phenol waste constitute the chief problems. Inhabitants of river basins in such districts are complaining of the peculiar, medicinal taste of their water. And the factories are complaining that the water ruins their high-pressure boilers. In all parts of the country domestic sewage adds dangerous germs and distasteful filth to the rivers and lakes.

Water purification plants must now be installed and operated at great cost by quite small towns that depend on the local river for their water supply. In many places the limit at which the purification plant can make the water safe for drinking has been reached. That limit is not far off in other localities. In Ohio a number of water purification plants are operated

in duplicate. Double coagulation, double settling and double filtration are in progress. This cuts down on the total loading of the water supply plant as far as bacterial pollution is concerned. But even this process cannot long keep up with the rate of pollution.

Many streams can no longer be used as sources of public water supply. Pennsylvania, for example, has classified her streams according to three grades. In the first are those already so badly polluted that no attempt will be made to purify them and they are virtually abandoned as a source of water supply. The second class contains streams of borderline conditions and here some attempt is being made to recover the purity of the stream. In the third class are streams still totally free from pollution. The state now prohibits the dumping of any untreated discharges into streams of this class.

Albany, N. Y., for many years struggled with the problem of water purification, using the Hudson River as the source of her water supply. Finally this was given up. No practicable amount of water purification could keep up with the pollution of the Hudson at Albany, and the city is now getting its supply from another source. Other cities, however, are frequently dependent on a single source of public (Turn to next page)



ACTIVATED SLUDGE treatment plant: aeration tank

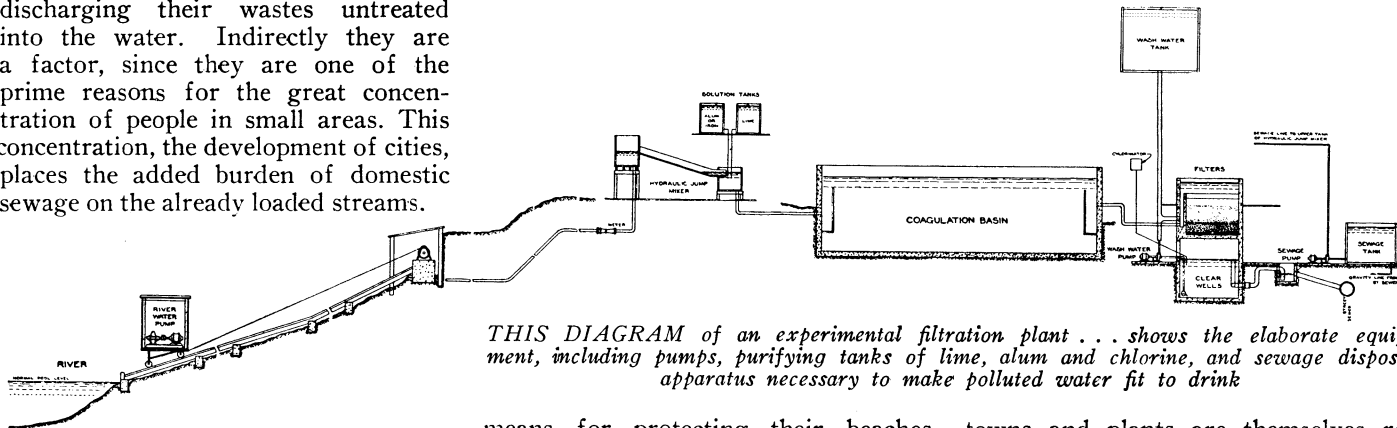
sewage and industrial waste are being dumped into the streams with reckless abandon, while filtration and water purification plants are enlarged and duplicated in frantic attempts to reclaim the water from the germs and solid filth that pollute it.

The motor tourist is already aware

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water supply. When a town's neighbors upstream dump untreated waste into the water, that town must treat and purify or find another source of water supply.

This critical condition of our streams has come about chiefly because of the urbanization that has been going on in the country since 1890. Factories themselves contribute directly to the pollution of streams by discharging their wastes untreated into the water. Indirectly they are a factor, since they are one of the prime reasons for the great concentration of people in small areas. This concentration, the development of cities, places the added burden of domestic sewage on the already loaded streams.



*THIS DIAGRAM of an experimental filtration plant . . . shows the elaborate equipment, including pumps, purifying tanks of lime, alum and chlorine, and sewage disposal apparatus necessary to make polluted water fit to drink*

The problem all over the country is becoming acute. The Schuylkill and Delaware rivers supply the public water for Philadelphia. The Ohio River system supplies from 12 to 20 large cities. Chicago, Toledo, Cleveland, Buffalo, Detroit and Whiting, Ind., are some of the large cities depending on the Great Lakes for their public water supplies. All of these cities are getting to the point where it will be impossible for them to take their water supplies from the present sources with either safety or esthetic advantages such as taste, odor, color and clarity.

In this connection we have added to the present immensity of the problem the fact that within the last 25 years the demand in the United States for esthetically superior water has changed almost completely. In other words, we are much fussier about the kind of water we drink than were our fathers. We demand water that is not only free from disease germs, but bright and clean with a pleasant taste or lack of taste, and with absolutely no odor. We are no longer content to draw water from our taps into large pitchers and let the sediment settle before drinking. We have always been known as a nation of water drinkers, and we have grown extremely particular about our national beverage, now more than ever, perhaps, since we are denied certain beverages of other countries.

Fortunately this demand for esthetically attractive drinking water has done much to stimulate communities to take steps toward sewage treatment. Another such helpful factor has been the increased demand for outdoor recreation, particularly bathing beaches. The New Jersey resorts along the Atlantic Coast and the cities from Los Angeles south on the Pacific Coast have been devising

their neighbors upstream. The modern development of extremely high-pressure boilers makes a pure-water supply imperative for most industrial operations. So now not only sportsmen and domestic users of water, but industrial plants as well are calling on state boards of health for purification of the water supplies. It often amounts to pot calling kettle black. For many of the most insistent of the

means for protecting their beaches from sewage pollution in response to this popular demand for the beaches for recreational purposes.

Sportsmen and fishermen have been demanding sewage purification for some time. They go so far as to insist that the water of all streams be returned to its original pristine state, regardless of cost in sewage treatment and disposal. This extreme demand is not entirely practicable, but certainly one can appreciate their dismay at the present fishless condition of so many of our streams and lakes. The fish that do survive the pollution have a hard time.

In a certain stretch of the Illinois River, where it runs through a thickly populated industrial section, only one sturdy species of fish now is found. Lately it was discovered that these fish were suffering from a peculiar condition resembling rickets in human beings. Scientists believe it is caused by a lack of greens in the fish diet. The aquatic vegetation which might serve as green forage for the fish has been depleted in the same stretch of river and during the same period of time that the fish developed the rickets-like condition. Pollution of the river was undoubtedly responsible for the shortage of green stuff just as it drove all but this one species of fish from that part of the river.

Finally, the factories themselves are demanding sewage purification of

towns and plants are themselves responsible for the pollution of the water supply of the next town or plant downstream. In a few localities they have been made to realize this fact and are getting together to solve the problem in cooperation for the entire watershed area.

Cooperation on a national scale is needed. Because of our many independent political units, legislative measures cannot accomplish much. A state may pass a law prohibiting dumping of untreated waste into the state's waterways. But this will not greatly lessen the pollution of those waterways if the next state upstream does not treat its sewage.

A stream will purify itself under certain conditions. But the growth of modern industry, which depends heavily on water power, has brought factories and towns to the rivers in such numbers that there is not space between them for the stream to rid itself entirely of the heavy load contributed by these factories and towns. Stream pollution is not measured in miles but in hours. The towns may be many miles apart, but a swift current carries the water from one town to the next in a few hours, a much shorter period of time than is required for the stream to purify its heavy load of pollution.

Every body of water has a measurable capacity for taking care of a certain amount of domestic and industrial waste. (Turn to next page)

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This varies with every stream and every kind of waste. Roughly this capacity is measured by determining how much oxygen the normal discharge of every individual in the community demands from the stream.

In treating water for modern industrial and domestic use we have three main considerations. The first is hygienic and is concerned with the maximum bacterial load which our present methods of water treatment can take care of. On the physical side must be considered that maximum load of suspended solid matter which streams can have and still be successfully treated. This aspect is an important one in cities like St. Louis, where the water supply comes from rivers that have a high content of solid matter, such as the Mississippi-Missouri system has. In these cities new devices are now employed to remove the tons of clay that are taken in with the city's water. Flood or high water fills the purification plants of such cities with so much clay and mud and other solid matter that they cannot function. The third consideration is chemical and includes such factors as hardness, acidity, corrosive properties of the water, etc. Water treated for some industrial plants now has a dizzying number of things done to it to make it suitable for feeding into the new high-pressure boilers.

However, all these measures for purification and treatment are cures, and not always successful ones, for the evil after it has come about. Preventive measures must be taken. The safety and future of our water supplies depend on treating sewage and waste before it is dumped into the stream. This is an expensive process. Treatment of domestic sewage costs anywhere from \$10 to \$15 per year per person. Treatment of industrial waste is also costly, but in many cases enough valuable material may be recovered to justify the expense, even to increase the profits of the firm. Mountains of potash, tons and tons of acids and other chemicals are thrown away every year in the discharges from industrial plants. Such factories as have been forced to treat their sewage before dumping have nearly always found that they could greatly increase their profits by the amount of material reclaimed from their waste. They had been literally throwing thousands of dollars into the streams every year. Complete

treatment of sewage is not always necessary and where it is not necessary it is just as inadvisable to carry it out as it is disastrous to neglect it where really needed.

Engineers are able to advise factories and towns as to whether or not they must treat their discharges. They are even able to prophesy in advance, judging from the growth of the town, when it must undertake sewage treatment. The Bureau of Sanitary Engineering of the Maryland State Board of Health, for example, makes tests at points every five miles of the Potomac River from its source to the District of Columbia. The Potomac is one of the chief sources of water supply for Maryland and the Bureau is keeping close watch on it to see how it is affected by the wastes from the industrial towns along its course. Already the Bureau has warned one large city on the upper reaches of the river that within five years it must put in the first unit of a sewage treatment works, because the Bureau from its surveys can prophesy when the stream will reach its maximum load for self-purification and when the towns below this city will need additional protection from their rapidly growing neighbor.

In various sections of the country the problem is being handled in various ways. So far, of all the major cities of the country, that is, cities of over 100,000 population, that are doing anything to treat their sewage before discharging it into their streams and lakes, only two, Chicago and Baltimore, do anything more than settle the sewage solids.

In the far west stream pollution is very closely bound with water conservation. Where water of any character is scarce, it is highly important that it be kept free from pollution. Waste water, after it has had some preliminary treatment, can be put to some use. The city of Pasadena is selling its sewage effluent, after treatment, to other communities for irrigation. When the bacteria have been killed, this material may safely be used to irrigate crops and gardens.

The Pacific Coast cities have been solving their problem of beach pollution by condemning and then buying up strips of land along the coast and operating municipal beaches, free from pollution. They have progressed faster than the Atlantic resorts, chiefly because of the economic aspect. On the Pacific Coast the bathing

beaches constitute one of the major industries of the region.

The Milwaukee sewage treatment plant is noteworthy because it is one of the few such plants that is not operated at a total loss from a monetary standpoint. Here fertilizer is recovered from the sewage. This is sold and helps to pay for the operation of the plant. New York City with her nine million inhabitants, her huge factory belt, and the large nautical population of her harbors, is faced with a tremendous problem. Already she is looking toward the Delaware River as a source of the public water supply. Negotiations with Pennsylvania and New Jersey have been going forward on this project. Meanwhile, the city is now planning the largest sewage treatment plant in the world, the conditions of the city's harbors and beaches having reached the point where this step must be taken. The new plant will be located on Ward's Island. To insure safety of her own water supply, New York City has for some time been installing and operating sewage treatment plants in a number of small towns and cities in the watershed area on which the great metropolis draws for her public water supply. The cost of installation and upkeep of these plants is paid by New York City.

Great strides have been made under the Ohio River Basin Interstate Stream Conservation Agreement. This has been a purely voluntary attempt by the interested parties to substitute for an official regulating agency for the entire Ohio River Valley. The organization has no legal power but has been able, by bringing pressure, to secure treatment of phenol waste in almost 99 per cent. of the plants approached during the three years the agreement has been in force. Phenol pollution is one of the biggest in the entire range of industrial waste pollution.

Systems like this have the greatest chance of accomplishment, Mr. Wolman believes. They follow the plans so successful in England and other European countries, where complete control of an entire watershed area is vested in one board of governors, regardless of the political divisions occurring in the area. Before such an arrangement can be put into operation here, group cooperation among industries might be fostered. *Science News-Letter, June 22, 1929*