

WATER SUPPLY IN RELATION TO DISEASE.

BY HIS LORDSHIP THE BISHOP OF TASMANIA.

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When we consider that water covers some four-fifths of the surface of the earth, and that the health of men depends upon its free and lavish use; when we consider again that, though the vast reservoirs of water are, for a wise purpose, salt and useless for drinking purposes, Nature has taken upon herself the work of a great distiller, we may well deplore the folly and apathy of communities of men who allow what was offered to them for their benefit to return thanklessly in waste to the ocean from whence it came. Nature has made the clouds her carriers of the purest distilled water, which has left all its salts behind, and then deposits her precious burden in the form of snow, or sleet, or rain, upon the tops of the mountain ranges and table-lands. Filtering through the porous strata of the hills, it reaches the impervious clays, and forcing its way horizontally it runs down the mountain sides. There comes man's opportunity for arresting its course as it flows past, and saying to it what Jacob said unto the angel in his mysterious conflict, "I will not let thee go, except thou bless me." It is folly—it is worse than folly, unless it be gross ignorance of sanitary laws, not to dam the streams at the mouth of the glens, and to construct reservoirs on such a scale for its accommodation that the poorest man and his family—and so much the rather, because it is poor and more likely to be ignorant—shall have enough and to spare of this life-giving element. Deprive him of it and what then? Just that which has been happening this summer among ourselves as a consequence? Drinking from stagnant wells, befouled by vegetable decomposition, animal refuse, and disgusting drains and miasmatic cesspools, and other forms of fever disease have been hovering over every household; scarlet fever and diphtheria break out, houses are rendered unwholesome, and the drunkard's thirst sets in.

It is a scandal to our civilization that Great Britain and her colonists should take no sufficient measures for purifying the sources of her domestic water supply. The alarm, indeed, created by the periodic visitation of the Almighty's scourge—the Asiatic cholera—and our more domestic typhoid diseases, led to the appointment of a Royal Commission of which Sir W. Denison was Chairman. I quote from their 6th Report the statement of their unanimous conviction, pages 140-1 :—

“But where the organic matter comes from drainage it is a most formidable ingredient in water, and is the one of all others

that ought to be looked upon with apprehension when it is from the refuse of animal matter, the drainage of large towns, the drainage of any animals, and especially of human beings. . . . That such an unspeakably disgusting mode of infection is not only possible, but imminent, over a very large proportion of the inhabitants of Great Britain, is conclusively proved by the numerous analyses of drinking water recorded in the preceding part of this report. So far from the horrible practice just indicated being exceptional, it is the rule. As the result of our inquiries into the polluted waters of this country we are compelled to state that it is a widely spread custom, both in towns and villages, to drink either the water of rivers into which the excrements of man are discharged, or the water from shallow wells which are largely fed by soakage from middens, sewers, or cesspools."

The fact that the propagation of the Asiatic cholera was due to impure water is clearly shown by the comparison instituted between the tenants of two Metropolitan Companies who lived on the same sites on the south of the Thames, in exactly similar conditions. The Lambeth Company had used remedial measures. The Southwark and Vauxhall Company had not. Of the tenantry of the former included in 166,960 occupying 24,854 houses, we read, page 148:—

"By this experiment, it is rendered in the highest degree probable, that of the 3,476 tenants of the Southwark and Vauxhall Company who died of cholera in 1853-4, two-thirds would have escaped if their water-supply had been like their neighbours'; and that, of the much larger number—tenants of both Companies—who died in 1848-9, also two-thirds would have escaped, if the Metropolis Water Act of 1852 had but been enacted a few years earlier."

In various townships which, in my professional journeys, I have to visit, I find typhoid prevalent, and I try from inquiry to trace it to its source. In one instance, all the houses below the source of the detected impurity were infected, and those above escaped. Even ducks were observed lying poisoned upon the stream close to the source of the evil. Whether victims to the poison or not, their putrifying carcases were adding to it. In another township, the bright waters of the Tasmanian river were subject to be polluted by the contents of a mill-race, situated at the entrance of the township, as well as by irrigation-waters, necessarily charged with organic manures. A third district seems to me never free from low fever, and a terrible amount of mortality. I observed the river as I entered the village to be receiving the excrementitious poison of a large family, a member of which had been lying ill for months and dying from cancer.

I need not enter largely into the science of the subject. Disease may be engendered and propagated, whether by germs or by chemical action. Probably each theory is true. By some means or other, by the air or by water, these germs are

brought to some delicate portion of our animal tissue, say the throat, or some part of our mucous membrane, and finding there congenial elements—congenial in a chemical sense—organic changes are set up. We may take alcoholic fermentation as an illustration of what occurs. When yeast, in its active condition, is placed in contact with sugar in solution, what is called a biological reaction occurs. A re-arrangement of its atoms sets in, first decomposition, then re-composition; for what we call fermentation is nothing more than this chemical change. New organisms not only form but multiply endlessly in succession. What occurs during this process I take as a typical example; what the organism of the yeast plant does to sugar or honey in solution, organic germs do to the human system under given conditions. To an unhealthy subject, presenting favourable conditions for chemical change, these germs are not in themselves poison, but become poison; and by that I mean that they effect organic alterations which constitute disease. A family at Brighton or Sorell, or Evandale drink these germs in stagnant water, consisting of animal or vegetable decomposition. Sometimes it is easy, as I have found it to be, to trace the spread of fever with the breeding-ground of these germs. It was easy to do so at Battery Point before the recent rains came to carry off the decomposing refuse in the open drains. And it is no available objection when you point to families who suffer, though they live furthest from the foul drain or the loathsome stream from which the tea is drunk. If you did not drink the water charged with these death-carrying germs, the cow did, and you drank her milk, and while the vigorous members of your family resisted the infection, the germs found a convenient soil in the unhealthy or the delicate on which to grow and multiply. Disease differs according to the character of the germ, be it typhoid, diphtheretic, or scarlet fever. The infectant in each case is some organic matter which comes in contact with a suitable soil, and at once sets up chemical organic changes in the warm animal laboratory which we call disease. Now I say that the object of the physician is to cure, the object of the Sanitary Reformer is to prevent it.

You will remember that a few years ago a terrible and destructive outbreak of typhoid fever took place in England. It was traced to the infected water supply of a dairy farm in Buckinghamshire. A bill has just, I observe, been brought before the House of Lords which deals primarily with cattle disease. I am glad to see also provisions in that bill—the Duke of Richmond's—for the better regulation of dairies. It concerns all who are interested in the health of children (and who are not?) to see that the quality of this, the most im-

portant domestic supply, be not endangered by vitiated water. The best energies of the State cannot possibly be so serviceably employed, or public funds so appropriately applied, as in providing an ample supply of pure water, and in protecting it, on its way to our homes, in town or country, by the severest penalties, from impurity and these germs of death. It is impossible to over-estimate the sanitary advantages of water. The penalty which Nature attaches to contempt of her provisions and neglect of her laws are not always immediate, but they are certain. As we go on drinking polluted water, or breathing impure air, the system is becoming more and more prepared to fall a victim whenever the avenging pestilence arrives. The powder is being stored and dried, waiting only the fatal spark. Call to mind the loss of children at Brighton, and more lately, at Sorell, where whole families have been well nigh swept off, and say whether there was not a preventible cause. Remember how many families were invaded when scarlet fever first broke out in Hobart Town. That was before the reservoirs were constructed, and the citizens had to draw their supplies from wells unprotected from the pollutions of sewers and other sources of poison. We shudder when we read of the 80,000 or 90,000 human beings slaughtered on the battle fields of Turkey, but there is not a single year when a larger number, relatively to the population, do not fall victims to modern barbarism. I say "modern barbarism," for old Rome was infinitely in advance of modern cities in practical cleanliness. We can fancy the profound sensation in the reign of Augustus which would have followed a report from the inspector of cloacal nuisances which contained the following passage:— "Some arrangement is required to direct the contents of the sewers along before filtering through stones, by which solid matters in suspension are arrested, undergo putrefaction, and pollute the atmosphere. The copious fall of rain we have had (*i.e.*, in February last) never swept the filth from sides of the greater part of the rivulet, though the centre channel was well flushed. During my frequent examinations of the rivulet, I have often observed refuse of all kinds thrown from the habitations bordering thereon into it. I also see organic refuse thrown from houses into the street-gutters shortly after they have been swept by the scavengers." This was the witness of your own "Officer of Health," written not long before an intolerable stench forewarned the inhabitants of Battery Point of coming mischief, before which not only the weaklings perished, but the strength of the young man has been bowed down. I know that we shall be met, as all reformers are sure to be met, by the cry of expense. Let me reply to this cry by quoting a passage from the Reports of your own Transactions,

1863, page 5. It is from a paper read by Dr. Hall, who said :—

“ From the long list I shall select for illustration, Macclesfield, a manufacturing town of 63,327 inhabitants in the county of Cheshire. I cite this example specially, because the question of economy to the public purse is so well exemplified by the diminution of crime, the repression of pauperism, and the consequent elevation of the moral character, which has resulted from the vigorous measures undertaken by the zealous and enlightened municipal authorities of this town to improve the physical health and enjoyments of the people. The rate of mortality in this borough for the seven years before sanitary improvements were commenced was 33 in 1,000. At the end of five years afterwards it was reduced to 26 in the 1,000. In children under 5 years of age, however, the death rate was diminished 13 per cent. In funeral expenses alone, calculated from the returns of 232 burial-clubs, £8,729 was saved. But there were 28,420 less cases of sickness also, which effected a further saving of £28,420. The duration of life was, moreover, increased by 3 years. Crime generally was diminished 4 per cent., and drunkenness amongst the working classes became considerably less. The reporter Mr. John May says :— ‘ These figures viewed in any light whatever cannot fail to carry conviction in favour of the policy of energetic sanitary measures ; and although landlords and cottage owners are, generally speaking, supposed to be objectors to what are necessarily expensive works, their personal interest is assuredly in favour of their execution. Houses are better occupied, tenants are less subject to sickness, rents are better paid, and repairs and dilapidations are diminished. I may add thereto, also, that the police, insurance, and poor rates, are likewise so much reduced, that ultimately the expenditure in waterworks, drainage, and other sanitary measures, becomes a wise economy. What would the City of Hobart save, if some of its worst streets could exhibit a decrease of 23 per cent. in trials for “ drunkenness and disorderly conduct ; ” “ 60 per cent. in making use of obscene and profane language ; ” “ 58 per cent. in gambling ; ” and in summary charges of every class, 26 per cent. ? What should we save in the support of widows and orphans, if the death rate of husbands and fathers was reduced in Hobart Town to what it is in the rural districts of Tasmania ? Last year—the healthiest on record for this island—the death rate in the city of Hobart for both sexes, aged from 20 to 60, was about 23 per 1,000, of those living at that age, at the census of 1861 ; while in the country districts the rate was only 7 per 1,000 or less than one-third. Yet Ely in England has done more than this. Hydraulic skill in providing a copious and pure supply of water, and establishing a perfect removal of *effete* and injurious matters by good sewerage, in that town, has reduced its rate of mortality to less than that of the surrounding country, though previously it was very much in excess of it. Ely, moreover, does not possess the local advantages for sanitary engineering that Hobart city does. The money loss on the 148 men and women, aged from 20 to 60, who died in Hobart city, over and above the natural death rate of the country districts of the island, would surely much exceed the additional cost entailed upon us by the interest of the outlay on our new waterworks, and an equally

comprehensive and effective system of sewerage ! ‘ A few years ago,’ says the *Macclesfield Reporter*, ‘ statements such as these were received with little favour, indeed, many people affected to ridicule them. Now, however, such vital statistics have assumed an authority which prevents even the most ignorant from questioning their real value.’ The President of the Social Science Association in his opening address at the meeting in Bradford in 1859 said :—‘ The benefits of improvements of dwellings, streets, courts, alleys,—of drainage, ventilation, supply of good water, removal of nuisances, piggeries, lay-stalls, bone-boiling, poisonous manufactures, with the whole array of noxious agencies, are now almost universally admitted. Yet many pause at the preliminary expense. It will therefore be a part of our inquiries to examine the pecuniary bearings of the whole subject, and show that a financial outlay on works such as these will be amply compensated by a financial return, in good measure, pressed down and running over.’

In Tasmania, nature has furnished us with the most noble water-fields. The whole island is intersected with the finest water-breeders. The Southern Range, with its Mount Wellington, has a grand and terminating bluff; then the Western Tiers, the Eastern Tiers, and the mountain ranges to the N.E., offering their priceless service to the Ringarooma district on the one side, and the great and rich agricultural plains on the N.W. on the other. Look at our own Mount Wellington, that grand old warder of our city. There is a rainfall and snow-fall stored there sufficient to supply the wants of a population indefinitely multiplied. There need be no stint of water if there were no stint of expenditure which would amply repay itself. No drain need be foul, no cistern need be empty, though, if I had my way, these cisterns, which are apt to become putrid, should be superseded by a supply of never failing water, under high pressure, supplied by cocks, that waste would be prevented or punished by a domestic flood. No one need be kept from healthy bathing, daily repeated. To public baths public wash-houses should be added, as in old Rome, and children saved from rheumatism, bred in the steam of soap-suds, from which men and boys make their happy escape on washing days in the nearest public house, and learn to drink. I pass over the fact too, that drunkenness comes as often from dirt as dirt from drunkenness. Each is its own parent. We talk now of enlarging our reservoirs, and the experiences of last summer, recorded in doctors’ bills, and more sadly on churchyard tombs, enforce the duty. I do not doubt, however, what the old Romans would have done in spite of their ignorance of hydrostatic laws. They would have spent the public money upon excavating canals, and building aqueducts, which might divert the ocean-bound stream, irrigating and fertilising half-barren plains on its way to the centres of population. Why, if not prepared to do this, why not, as it gushes forth

from the slopes of Mount Wellington, at the juncture of porous and non-porous strata, catch it in spacious reservoirs, three-fold larger than at present, imprison it in aqueous granaries for the present demand and for future scarcity? "All the rivers run into the sea, yet the sea is not full; into the place from whence the rivers come, thither they return again." It is our duty to ourselves, and to our fellow-men that they shall not do so before they have been made, according to the purposes of a Divine Providence, to do their utmost to bless us with health, with cleanliness, with purity, with more abundant food, and with an increased capacity of enjoyment which is within the power of water to minister to mankind.