and in getting out the curve of the decline of consumption for the last twenty years he had noticed how the fall had ceased in years of high summer temperature, and there was a remarkable similarity in the curve for consumption and diarrhoea. He hoped Dr. Dearden would enquire further why workers in high temperatures had bad health.

THE PRESIDENT said they were accustomed as medical officers of health to build their statistics on mortality, but they had gradually been considering more the invalidity of the people.

DR. DEARDEN (Manchester), in replying, said the Local Government Board approved of the office of certifying surgeon and medical officer of health being held by the same persons. That policy was also adopted by the Home Office. When there was a vacancy the Home Office he knew were prepared to give preference to one who was a medical officer of health and could devote the necessary time to the two offices. He thought as time went on that would prove an important factor in regard to co-ordination.

He would, however, venture to express the opinion that, in large manufacturing towns, where the appointments are bound to be distinct, there should be no difficulty in devising a system, by cypher code, understood only by the two departments, whereby very useful information could be provided to the certifying surgeon as to state of health during school life.

A MUNICIPAL MATERNITY HOSPITAL.—The ideal system of health administration for the reduction of infantile mortality would include a municipal maternity hospital (I have explained in previous reports why the workhouse infirmary cannot supply this want) as a centre attached to which would be a few health visitors, who would not only follow up the cases attended in the hospital when they returned home, to give the mothers advice on the best way to secure the health of their babies, but who would also be available to visit for the same purpose mothers who did not come to the hospital, but were confined in their own homes. I have long been impressed with the enormous potential value of a maternity hospital in this borough, as indeed I think has everyone who has had some opportunity of observing the conditions under which a large number of the confinements take place in this town. Up to the present my representations on the subject have had no effect, but I am not without hope that some day the Sanitary Authority may be converted to the view that a municipal maternity hospital is an essential part of the health administration of a large town like Portsmouth. In the meantime, there is an opportunity for a wealthy philanthropist.—*Annual Report of Dr. A. Mearns Fraser, Medical Officer of Health, Portsmouth.*

VILLAGE WATER-SUPPLIES.*

By GERARD C. TAYLOR, M.A., M.D. Cantab., D.P.H.,
County Medical Officer of Health of Berkshire.

THE subject that I have selected for my address is one that has interested me considerably for some years, and I venture to submit my present views, partly in the hope that my remarks may indirectly stimulate further inquiry into the adequacy of existing water-supplies, and partly with the object of obtaining the benefit of criticism.

In Public Health work there are few tasks more difficult to accomplish than that of persuading people to take effective action with regard to the provision of pure and abundant water-supplies. Complaints to the Local Government Board, such as are referred to in Section 299 of the Public Health Act, 1875, are, I believe, rare; and no instance of a complaint by a parish council, under Section 16 of the Local Government Act, 1894, has occurred in my personal experience.

The usual unwillingness of village communities to remedy defective water-supplies appears to be due chiefly to two considerations—the first is financial, and the second is dependent on the opinion that the risks are so remote that they may fairly be neglected.

What are actually the ascertained facts on which one can rely in urging the substitution of a pure for a contaminated water-supply? The evidence in proof of the communication of certain diseases by means of bacteria contained in sewage-polluted water is incontrovertible, and the possible conveyance of entozoa through the medium of water is equally clear; but as yet we have little knowledge of the effect on health of the chemical constituents of sewage-polluted water, and though we know that diarrhoea is sometimes associated with the drinking of water containing much organic matter, we cannot in every instance state definitely to what component this is due. As regards inorganic matter, the metallic salts, such as those of lead and zinc, may give rise to poisoning, and excessive amounts of calcium, magnesium, and sodium salts in solution, as well as mineral matters in suspension, not infrequently cause disorders of the digestive organs.

The apologist for inaction usually relies on local tradition. He points out that the health of the villagers has been as good as that of

* Presidential Address to the Home Counties Branch of the Society of Medical Officers of Health, delivered on October 21st, 1910.

their neighbours, who enjoy the advantages of a water-supply the quality of which is above suspicion, and that no epidemic in the village has ever been ascribed to polluted water. He has no belief in the dangers arising from the proximity of privy pits and farm yards; these sources of possible pollution have existed since time immemorial and he has no knowledge of any harm having resulted. And as a final argument he will possibly compare rural with urban mortalities, completely ignoring the chief factors which at the present day conduce to a high urban death-rate.

As public health officers our efforts must be directed towards the prevention of disease, it is our duty to ascertain what water-supplies are deficient in either quality or quantity, and we should not rest satisfied until the defects are remedied. Professor de Chaumont put the case very clearly—"Our aim ought to be to get the purest possible water at all times and in all circumstances, and not to trust to chance to save us from the effects of our own neglect."

Until detailed information is collected with regard to the water-supply of every parish in England and Wales, it will be impossible to appreciate the full extent of the needs to be met; but from the particulars given in the annual reports of medical officers of health, as well as in the reports of the Local Government Board inspectors, it is clear that in many areas the question has so far received but scant attention.

Memoranda were issued by the Local Government Board in 1897 and 1898 calling the attention of District Councils to their responsibilities under the Public Health Acts for securing to the inhabitants of their districts a proper and sufficient supply of water, and urging them to procure accurate information on all points affecting the water-supply. This request appears to have been very indifferently complied with in many instances, and one welcomes the regulations recently issued under Section 17 (1) of the Housing and Town-Planning Act of 1909, as their effect must be to render available much of the requisite information.

In regard to sources of water-supply, I believe that one is very rarely justified in approving of rain water collected from house roofs as a supply for potable purposes; contamination is inevitable, and all devices for getting rid of the first washings from the roof and for filtration and storage require an amount of supervision that is seldom practicable. But for most other

domestic purposes one should certainly encourage the provision of adequate storage for rain water.

The water in streams and rivers is liable to so many opportunities of pollution that it is now universally condemned as a source of supply, unless subject to sedimentation and filtration prior to distribution, and, at least in my experience, these processes are not likely to be efficiently attended to when the supply is for a single village.

Many excellent schemes are now in operation where the water from springs, and occasionally from surface gathering grounds, is impounded in a reservoir on some hill-side and delivered by gravitation. So long as due precautions are taken, the risks of contamination in such cases are few.

In actual practice, most villages and isolated houses are dependent on either surface or deep wells. To the latter of these sources no exception can be taken when the water rises to near the surface or when an oil engine or wind power is available for raising the water, provided that the well has been properly constructed. In many instances, however, the water must be laboriously raised by means of a windlass, from possibly 250 or more feet deep; and unless the well is covered in and some apparatus such as Jones's water elevator is employed, there must be considerable risk of pollution gaining access to the well. The chances of contamination in the case of a surface well are usually many times greater, and on ascertaining that such a well is subject to pollution, one is not infrequently faced by the impossibility of finding a convenient site for the sinking of a new well. This difficulty has been forcibly brought home to me on two occasions lately. In one instance the district medical officer of health and myself were searching for a well from which pure water could be obtained for a small village school. The existing supply had the following composition and was derived from a shallow well in the Chalk, obviously liable to pollution:—

(The results of the analysis are stated in parts per 100,000.)

Total dissolved solid matter	...	...	170
Chlorine in chlorides	...	...	17.14
Ammonia, free and saline	...	...	.005
Ammonia, albuminoid	...	...	.018
Nitrogen in nitrates	...	...	6.6
Nitrogen in nitrites	...	...	Traces
Oxygen required to oxidize organic matter in three hours	...	...	.19

After a careful inspection of all the wells in the village, we had a sample taken from the one which appeared least liable to pollution. The analyst's report was as follows:—

(The results of the analysis are stated in parts per 100,000.)

Total dissolved solid matter	...	...	118.57
Chlorine in chlorides	...	...	11.28
Ammonia, free and saline	...	...	.004
Ammonia, albuminoid	...	...	.014
Nitrogen in nitrates	...	...	2.6
Nitrogen in nitrites	...	...	0.
Oxygen required to oxidize organic matter in three hours	...	...	.10

"The total dissolved solids, the chlorides and nitrates are considerably larger than the natural quantities; the proportion of organic matter is over the average. From the analysis it is evident that the subsoil near this well is polluted and the water is not of satisfactory quality for drinking or domestic purposes."

In the other instance to which I referred, the village is low lying and situated on the Upper Greensand. There is no general system of sewerage, and the houses and farm yards are all closely packed together. On opening the ground near the school well, after the analyst had given an unfavourable report on a sample of the water, a leakage was found in the drain from the urinal and lavatory sink. The drain was taken up, and a new stoneware drain was laid and completely embedded in concrete. The soil near the well was cleared away, and the upper portion of the brickwork of the well was covered with cement. Several months later another sample was taken, but as evidence of pollution was still present a tube well was driven to a depth of 25 feet at some little distance from the old well. On analysis the nitrate figure was found to be somewhat high, but the ammonia figures and proportion of oxidizable organic matter were just within permissible limits.

I have instanced these two villages as examples of conditions met with somewhat frequently. Analytical evidence is not always available, but I think one is justified in concluding that similar surroundings must lead to similar pollution.

In very few villages does one find the individual cottages surrounded by sufficient land to allow of each household depositing sewage and other refuse in the garden with safety to a water-supply in the vicinity. Possibly the nitrifying action of bacteria may effect purification to such an extent that the water in the subsoil, though it contains the actual elements

of sewage, does not contain pathogenic organisms under most conditions; but should excessive drought or rainfall occur, especially when the latter succeeds the former, the danger of sewage organisms finding their way into the subsoil water and thence to the wells must become accentuated.

Vivian Poore's experiments proved that water taken from a properly constructed shallow well might be of a good chemical standard even though the soil at no great distance was used for the disposal of excreta, provided that the sewage was distributed systematically. But with what frequency are wells, at least old wells, found to be properly constructed? Many that I have examined seem built with the express intention of letting in the maximum amount of water from the ground level downwards; and how next to impossible it appears to induce cottagers to deal sensibly with the household sewage and refuse!

In determining what action one will take in regard to any particular surface well, one must primarily be guided by the result of an examination of the well and its surroundings; but the evidence to be derived from chemical analysis, and if possible from bacteriological examination also, should not be neglected. When the medical officer of health is not carrying out the analysis himself, he should see that full information is supplied with the samples. I am inclined to lay stress on this point, since in the absence of special instructions the usual custom appears to be to indicate merely the locality from which a sample is taken, without giving any note as to the nature and surroundings of the well or other source of the water. And I think all analysts would be well advised to follow the practice of asking for the information before giving an opinion on a sample.

The minimum distance from a well at which a privy or ashpit may be constructed is usually given in bye-laws as 50 ft., and the minimum distance for a cesspool as 100 ft., but in Professor Frankland's opinion no cesspool should be within 200 yards of a well. Few shallow wells in the immediate neighbourhood of a dwelling can in reality be considered safe sources of water-supply. Refuse and slop water are frequently disposed of on the nearest available piece of ground, and one learns from experience that it is by no means uncommon for defective drains to exist in unsuspected positions around houses and in proximity to

wells. Moreover, experimental evidence has proved that the distance to which the influence of pumping extends varies greatly in different cases. In fine sand and fine gravel the distance is given by Rogers Field as 15 to 39 times the depression. In the Chalk it extends to at least 57 times the depression, and to a very much greater distance when the strata are extensively fissured; in very coarse gravel 68 to 160 times the depression. In New Red Sandstone, where extensive fissures exist, the distance is 143 times the depression.

On discussing with some landowner in the neighbourhood the risks to which the village water-supply is subject, one will possibly be informed that each cottager may hire an allotment outside the village, where he can deposit all refuse, and that the drainage of the place is sufficiently provided for. But there is small comfort to be derived from these suggestions when one knows that the closets are almost entirely on the privy-pit system, and that the drainage system is merely a haphazard collection of surface-water channels, some piped in, others left open, and one has a vivid recollection of accumulations of refuse in back gardens.

Let me quote a few notes from annual reports.

Village No. 1.—Wells sunk in sandy loam and gravel; they are liable to pollution.

Village No. 2.—Shallow wells, chiefly fed by surface water. A spring affords a supply for part of the village.

Village No. 3.—Water-supply from wells in the Gault and Chalk, liable to pollution. The stream which runs through the village is largely used as a means of supply.

Village No. 4.—Shallow wells in clay soil. The supply is not good. Stream water is used for many purposes. There is a public pump in connection with a well of doubtful purity.

In the above villages, cesspits are used as a means of collecting excreta; pail-closets and some form of privy or ash-midden are also employed. There is no public scavenging.

The medical officer of health of a rural district has in many respects a far more difficult task to perform than his town confrère. Rateable values in the country are small, and the expense of any considerable scheme of sanitary reform frequently appears almost prohibitive. Nuisances which would not be tolerated in towns are considered as inevitable in villages; and because life in the country is on the whole healthier than in urban

centres, there is a tendency to let existing conditions continue, instead of aiming at the attainment of a higher standard of comfort and health. Improvements are, however, being effected by slow degrees. The newer houses, if not usually as picturesque, are generally better constructed. Pail-closets are gradually superseding privy pits and middens, whilst in other villages, and some of these with not more than a few hundred inhabitants, one finds efficient modern sewerage schemes; and the number of villages provided with water mains is steadily increasing. Certainly it is desirable, and in many instances it is possible, to hasten the rate of progress.

Apart from the question of expense, there is no reason why the water-supply and drainage of every village should not be as good as, or better than, that of a town, and I feel convinced that in a very large number of cases the cost of a water-supply by main need not amount to more than 2d. or 3d. per week for houses with a rateable value under £10, and that this would not be too great a burden on the inhabitants. On many farms the question of pure water-supplies has become urgent, owing to the action of several of the principal dairy companies, and there are other reasons for hoping that rural communities are gradually beginning to realize the necessity for collective action in their own interests. I fully recognize that one must not ignore the financial side of the question, at the same time I look upon the provision of pure and ample water-supplies as a matter calling for some sacrifice on the part of the present generation, both for its own sake and that of future generations.

Nearly all the parishes in Berkshire to the east of a line drawn north and south through Reading are already in the area of supply of some water company or district council, and mains are laid to many of the villages and outlying houses. In the western portion of the county the villages are for the most part more scattered, but several water companies have obtained powers of supply over considerable areas, and the district councils or private estate owners have met some of the more urgent needs by the construction of water-works. Similar provision has been made in many rural areas of England, and I only quote Berkshire as I am more fully acquainted with the work in progress there.

Whenever the majority of the wells in a village are found to be liable to pollution, I submit that it would be far better to devise a

main water scheme for the whole village rather than attempt to reconstruct existing wells. And where a group of villages is dependent on wells drawing from polluted strata, it would appear preferable to link up the villages on one system, instead of constructing separate waterworks for each. Further, there is an increasing body of opinion that it will be found advantageous to map out the whole country into areas of water-supply, corresponding in most instances to watershed areas. If this principle were adopted, each area might be administered by a board nominated by urban and rural authorities, provided that the board was made directly responsible to some central authority. The areas of such water boards would not be limited by district or county boundaries any more than the areas of water companies are at present, but the primary duty of each board would be to see that the whole of its area was adequately supplied with water, and not as in the case of water companies to look upon every proposed extension mainly from the commercial point of view.

Compulsory combination seems to me to be the only method which will meet the requirements from both a public health and financial aspect. It is true that voluntary combination is at present permissible, but there has been a very limited application of the power, due in part to local apathy in regard to the provision of adequate water-supplies, and in part to the jealousy with which people regard the acquisition of water rights in their own neighbourhood for the benefit of outlying districts. I have no wish to imply that small schemes should not be undertaken for particular communities; excellent instances of such are to be met with and similar installations will no doubt be provided in the future whatever system of control is adopted.

In Dr. Thresh's report on the water-supplies of Essex one finds the fullest account that has yet been published of the sources of supply and the requirements of a particular county, and the report provides an excellent example of the lines on which similar inquiries should be conducted. The special memoirs on county water-supplies, nine of which dealing with ten counties have already been issued by the Geological Survey Department, contain much valuable information, but not the full details necessary for forming an opinion on the needs of each district.

A thorough inspection of all village water-

supplies ought to be, and I trust will very soon be undertaken by public health authorities, and these investigations should be followed by analyses of a considerable number of samples. It is only in this manner that one can obtain the evidence necessary to prove what are the actual needs of the villages in respect to water-supply. Analyses on the scale indicated are not likely to meet with the approval of most district councils, but one can at least make the preliminary inspections and urge further action. In many instances one must for the present be content to tinker with the old sources of supply and to encourage improved methods of refuse disposal, but I am convinced that we should aim at obtaining abundant supplies from sources free from any liability to contamination.

TOOTH-BRUSH CLUBS.—What is known as a "Tooth-Brush Club" has been formed in certain day schools, and has been of service in improving dental cleanliness. The head teacher or the Care Committee lays in a stock of tooth-brushes which can be obtained wholesale for 2½d. each; these brushes are then, after some preliminary dental instruction, sold to the children for 2½d. each, paid in instalments of ½d. or ¼d. a week, the small profit being used to supply tooth-brushes to very poor children. Precipitated chalk is also sold in halfpenny-worths, and it is found that numbers of the children readily join the clubs, and some even save their money to buy tooth-brushes as birthday presents for their parents, and one boy went on his own initiative into the streets at Christmas to sell toys in order to obtain money to join the tooth-brush club. The tooth-brushes are called for inspection periodically, and on every convenient occasion the necessity of tooth-cleaning is insisted upon. The adoption of this system throughout the Council day schools would lead to a great improvement in the general condition of the children's teeth, and now that tooth-brushes have been placed upon the sales requisition list school care committees and head teachers could co-operate in promoting general cleanliness. The prevention of caries by educative measures and by prophylaxis will be less expensive than its treatment by dentists.—*Annual Report of Dr. James Kerr, Medical Officer (Education), London County Council.*

A MUNICIPAL TUBERCULIN DISPENSARY.—The Portsmouth Town Council on February 14th decided, with only one dissentient, to establish a tuberculin dispensary on the lines recommended by Dr. Mearns Fraser, the Medical Officer of Health, in his recent report on the subject. This will be the first municipal tuberculin dispensary in the country.