was as far as possible carried out, malaria would be far from being so rampant on railways as it is now.

It is recommended that the same principles should be applied in towns, but here, of course, the steps to be taken must be governed by local conditions, and the reports are largely concerned with recommendations on this head as to particular places. Daniels points out that it must always be remembered that in a European convalescent from an attack of fever his parasites will be in the stage capable of being transmitted to the mosquito. He must therefore be well guarded against the attacks of mosquitos, both for his own and his neighbours' sake, and with such an inmate thorough fumigation of the house should always be practised. Stephens and Christophers state, further, that in Europeans parasites are rarely found except in definite attacks of fever, and that, even in the case of those who habitually sleep without mosquito nets and exposed to the risks of constant infection the parasites were very seldom found, so that at any one time only a very small percentage of Europeans showed the least trace of malarial infection, whereas in native children in Lagos and on the Gold Coast the frequency with which *gametes* occurred was very striking. They insist that it should be clearly realised by Europeans in the towns that they are dwelling in the midst of thousands of cases of malaria none the less dangerous to them, though in the native child presenting none of the characteristic signs of an attack of fever. They thus sum up their main conclusion, which is "that malarial fever is a contagious disease contracted through the medium of the mosquito from the native child."

Need for a Sanitary Service.

Daniels, writing of British Central Africa and British East Africa, makes the following observations, with which we may conclude this notice of the reports:

> Sufficient attention is not paid to sanitation in its widest sense. Sanitary works are usually performed either by local Boards or a general Board of works, with or without medical advice. They are not directly under the control of a medical department. Money set apart to the medical departments is entirely absorbed in treating disease, that is, for hospitals, nurses, etc., and little or none spent in preventive medicine. Most of the money for public works is spent on public buildings and improvements which may be indirectly beneficial to the public health or not. Money devoted to preventive medicine or sanitation should be kept apart from either the medical or public works votes, and accounted for separately. A separate department for sanitary affairs distinct either from public works or the medical department would, I think, be advantageous in most places.

ANOPHELES AND AGUE IN ENGLAND.

Grassi has stated that the geographical distribution of the genus *Anopheles* in Italy coincides with that of malaria, and has used this generalisation to exclude, on the ground of their wider geographical distribution, a number of blood-sucking insects as possible carriers of the parasite of malaria. Celli[1] showed that the statement that the distribution of *Anopheles* corresponded with that of malaria is not true even for Italy, as he found it in various Alpine valleys in situations where there has never been any malaria.

In the first number of the *Journal of Hygiene* there is a paper by Drs. George H. F. Nuttall and Louis Cobbett and Mr. Strangeways-Pigg, giving an account of a detailed investigation which they have made with regard to the distribution of *Anopheles* in England.

Three species of *Anopheles* are known to occur in England; these are *A. maculipennis* (*A. claviger* Fabr., *vel maculipennis*), *A. bifurcatus*, and *A. nigripes*. Of these, the first-named is by far the most common.

At the present day *Anopheles* in Great Britain are most numerous in low-lying land containing many ditches, ponds, and slow-flowing water suitable for the habitat of the larvæ, and corresponding to the districts where ague was formerly prevalent. Further, they found not only that *Anopheles* is present in parts of England where malaria used to exist, but also in other parts where there is no history or tradition of malaria ever having existed. It therefore appears that the disappearance of ague from Great Britain does not depend upon the extinction of mosquitos capable of harbouring the parasite, and the authors suggest that the disappearance of the disease is probably due to several causes operating together:

> (*a*) A reduction in the number of these insects consequent upon drainage of the land, this being in accord with all the older authors, who attributed the disappearance of ague largely to this cause.
>
> (*b*) Reduction of the population in infected districts as the result of emigration about the time when ague disappeared from England; this would naturally reduce the number of infected individuals, and thus lessen the chance of the *Anopheles* becoming infected.
>
> (*c*) It is possible that the use of quinine has reduced the chances of infecting the *Anopheles* through checking the development of the parasites in the blood of subjects affected with ague.

They express the opinion that the first-mentioned cause seems to have been chiefly operative, and that the existence of *Anopheles* in non-malarious districts may explain the occasional occurrence of ague in out-of-the-way places, for with suitable conditions of temperature and the requisite number of *Anopheles* a malarious patient coming from other parts might infect the local insects, which in turn would spread the infection to healthy persons. It would appear, therefore, that the actual number of *Anopheles* in a district may have a considerable influence on the prevalence of malaria.

[1] BRITISH MEDICAL JOURNAL, October 13th, 1900, p. 1137.

THE PREVENTION OF WATERBORNE TYPHOID IN ARMIES IN THE FIELD.

In a paper on this subject read before the Epidemiological Society on January 18th by Dr. Louis Parkes and Samuel Rideal, D.Sc., F.I.C., the outbreak of typhoid fever among our troops in South Africa was discussed. The questions arising in connection with the outbreak might, said the authors, be summarised as follows:

1. Has the number of cases of enteric fever, proportional to troops employed, exceeded that characterising other campaigns in similar climates, with similar disadvantageous sanitary surroundings?
2. Was the likelihood of enteric fever becoming epidemic amongst the troops foreseen by the military authorities?
3. Were the best practicable and available means taken to safeguard the army both in stationary camps and when on the march?

It seemed highly probable that the first cases amongst the troops arose from the consumption of water infected with the enteric virus, derived either from the civil population with whom the troops were brought into contact, or more probably from the Boer combatants, amongst whom it was generally supposed the disease was present from their first taking the field.

Inasmuch as troops on the march were always careful to choose camping grounds which had not been previously in use, unless strategical reasons rendered such a course necessary, whereas they were often dependent for their water supply on sources which had been already defiled, either by the enemy or by advance columns of their own side, the assumption appeared to be warranted that if it were possible to render all water used in drinking by the troops innocuous, there would be no general development of enteric fever on a large scale.

The sterilisation of water for the use of troops, either by boiling or filtration, was impossible of attainment during the rapid marches and swift changes of position necessitated by war conducted on modern methods. Even if filters or boiling apparatus could be made to accompany a rapidly-moving column, it was very doubtful if men parched by long marches, performed under a fiery sun and in clouds of dust, could be restrained from slaking their thirst as soon as they arrived at water. Failing the sterilisation of water by boiling or filtration, it was asked, Is there any substance which can be added to water which will destroy the virulence or inhibit the growth of the bacillus typhosus, whilst not rendering the water unpalatable or injurious to the health of the consumer?

Ordinary poisons—or even non-poisonous disinfectants—were inadmissible for this purpose. There were other substances, however, which might be expected to prove beneficial as regards their effect upon bacillus typhosus, whilst not harmful to the consumer. Such were the dilute mineral acids—dilute sulphuric acid, *B.P.*, and dilute nitro-hydrochloric acid, *B.P.*, and the organic acids, citric and tartaric, which were largely used in the manufacture of lemonade. Other substances with which the authors had experimented were acid bisulphate of soda, and acid phosphate of soda, and sulphovinate of soda. All these were bodies of which the human system was tolerant, whilst in the proportions which they had found to be required (after contact of from fifteen to thirty minutes) to inhibit the growth and activity of bacillus typhosus, they were quite palatable, imparting a subacid flavouring, which was agreeable to the taste, and would materially aid in quenching thirst. After reference to previous work on the subject, by Stutzer, Christmas, Reinsch, Schumberg, and Braithwaite, the authors gave details of experiments which they had performed.

In the case of tartaric, citric, and nitrohydrochloric acids, it did not appear that anything less than the maximum *B.P.* dose per pint of water was efficient to sterilise if the contact was not to last longer than fifteen minutes. Half the maximum dose (10 grains) per pint was inefficient in the case of citric and tartaric acids after 15 minutes contact, whilst the minimum dose (5 grains) per pint of citric acid had no effect after twenty-four hours' contact; and in the case of tartaric acid the minimum dose did not completely sterilise after the same period. Of the two, tartaric acid appeared to be the more potent in its destructive action upon bacillus typhosus.

As regards the dilute acids, nitrohydrochloric and sulphuric, the former appeared to be more efficient than the latter; but no further experiments were made with them, as it was considered essential that the substance to be carried by individual soldiers in the field should be a solid, which could be made up into small tabloids, and not a liquid, which would have to be carried in a bottle and be measured out with some exactitude when required for the purpose of sterilising the water to be used for drinking.

Acid sodium bisulphate was not a *B.P.* medicinal substance. It probably had no purgative effect, as the astringent properties of its free sulphuric acid would tend to counteract any laxative action of the sodium sulphate. The minimum purgative dose of sodium sulphate was a quarter of an ounce, and as the authors only suggested the use of 15½ grains of the bisulphate to every pint of water, a man would have to drink 7 pints of water before a quarter of an ounce of salt, not known to be purgative, would be taken. Even if this quantity of water was drunk in a day, there is no evidence that a quarter of an ounce of the bisulphate would exert any harmful effect.

There was evidence that the bacillus typhosus was killed by only five minutes' contact with sodium bisulphate in the proportion of 1 gram (15½ gr.) per pint of infected water; but in their opinion it was better that contact should be made for fifteen minutes, in order that sterility might be ensured. Experimental trials were also made with acid sodium phosphate and with sodium sulphovinate, but these substances were found inefficient. It might be used as an argument against the deductions which the authors thought they were entitled to draw from their experiments, that in broth cultures of bacillus typhosus the organisms were living under artificial conditions, and that waters infected by natural means derived the living virus directly from the fæces or urine of an enteric fever patient. There would be reason in such a line of argument if it could be shown that the bacilli on emerging from the human body were more resistant to adverse agencies, such as their chemical solutions were, than those which had been cultured and subcultured in broth.

That this was not generally held to be so was now recognised, for the probabilities were in favour of the view that pathogenic organisms by propagation in artificial media outside the human body tended to become saphrophytic; and whilst very probably losing in virulence, yet acquired higher resistant powers to agencies affecting their life and growth than they ever possessed when they flourished as parasites in the human body.

The authors thought there was every probability that the agency which proved fatal to the subcultured bacilli would have an equal if not greater effect upon organisms of high virulence immediately derived from the excreta of an enteric fever patient. Experiments were made by them to determine the dose of the poison or the number of bacilli that must be imbibed in order to induce the disease, a subject on which practically nothing certain was known. Their conclusions were that, on the whole, it would appear as if one might be justified in assuming that (1) water naturally infected with the virus of the disease did not contain so very large a proportion of the bacillus; that (2) this organism was not by any means resistant to acids or other weak disinfectants; and (3) that the use of such simple means as suggested by the authors for combating infection had possibly a future before it, more especially under conditions of life where the means of sterilisation by boiling and filtration were not readily available.

As regards the use of sodium bisulphate during a campaign, they recommended its being employed in the form of tabloids, each tabloid to contain 5 grs. of the bisulphate. The tabloids should be made to dissolve quickly in water, and for this purpose the minimum quantity of gum arabic or other adhesive substance should be used in their manufacture. The tabloids should be put up in well-made light metallic boxes, to hold about ¼ lb. weight—equivalent to about 350 tabloids—enough to sterilise over 100 pints of water at the rate of 3 per pint. One of these boxes should be carried by every soldier in his haversack. Supposing the soldier to consume 5 pints a day when on the march, the ¼ lb. tin would suffice for nearly three weeks, at the end of which time he will probably again be in touch with his transport.

Instructions should be given by the medical officer to the rank and file as to the use of the tabloids, and more especially as to the desirability of allowing all contaminated water to remain in contact with the dissolved tabloids for at least fifteen minutes before being consumed.

The acid tabloids would be found to render the water much more effective in slaking thirst, and there would, in consequence, be less inclination to drink large quantities of water, a smaller quantity when acidulated sufficing. The tabloids might also be used as thirst lozenges when water was scarce, and would, they believed, be found useful by promoting the secretion of saliva, and so preventing parching of the mouth.

The authors were informed by an officer, recently returned from the war, that he found the "thirst lozenges" he took out with him from England most useful. There was an immense demand for them by the men of his company; and the men who took them were satisfied with much less water than those who failed to obtain any.

NOTES ON HEALTH RESORTS.

CLIMATE OF TENERIFFE.

By STANFORD HARRIS, M.D., M.R.C.S.,
Treasurer of the Güimar Hospital for the Pure Air Treatment of Tuberculosis.

APROPOS of the subject of climate as a factor in the open-air treatment of tuberculosis, I troubled you with a short communication which appeared in the BRITISH MEDICAL JOURNAL of July 15th, 1899. As I now have a year's complete record of thermometric observations, it may interest some of your readers to have the main facts laid before them. It will be seen that the special feature here is equability. We never here fall to within 15° above the frost line, and the occasions when the temperature has reached 90° in the shade can be counted on the fingers of one hand. The observations taken from January 1st, 1900, to December 31st of the same year give us the facts below stated expressed in the scale of Fahrenheit.

1900. Days of observation, 365. Mean temperature at 9 A.M. for the whole year, 66, 63.

Winter (January, February, March, October, November, December), 63.07. Summer (April to September), 70,21.

Mean relative humidity (saturation=100) at 9 A.M., whole year, 64, 93. The lowest relative humidity of each month was, January, 50; February, 28; March, 50; April, 31; May, 43; June, 47; July, 38; August, 27; September, 48; October, 64; November, 45; December, 34.

Mean maximum temperature of each 24 hours for whole year, 72.89. For the winter alone, 69.02; for the summer alone, 76.75.

The actual maximum attained in each month was January, 70; February, 80; March, 73; April, 86; May, 85; June, 87; July, 87; August, 96.50; September, 85; October, 89; November, 81; December, 74.

Mean minimum of each 24 hours, for whole year, 57.70.

The actual minimum attained in each month was: January, 47 (lowest recorded, January 2nd); February, 48; March, 51; April, 51; May, 54; June, 56; July, 59; August, 59; September, 59; October, 55; November 52; December, 51.

Inches of rain, whole year, 13.67. The 13 inches were distributed as here given:

January, 4.34; February, 1.04; March, 2.26; April, 1.45; May, 0.18; June, 0.00; July. 0.00; August, 0.15; September, 0.22; October, 3.70; November, 0.25; December, 0.08; equal, 13.67.

The days on which the sun shone eight or more hours were:

In January, 24; February. 22; March, 18; April. 25; May, 24; June, 27; July, 25; August, 22; September, 11; October, 20; November, 27; December. 23.

This means only 97 cloudy days in the year, and few of these had no sunshine at all.