pulse was 102 per minute. The bowels had moved freely. Exophthalmos was slight, but the upper lids still lagged.

On October 29th vomiting set in, and there was frequent hicough. The bromide and digitalis mixture was stopped. Mental excitement was increased. During the last few days the patient was fed tentatively: she was given as much food as she could be induced to swallow, mainly milk puddings, but much was vomited immediately and pain, which was described as an aggravation of the throbbing in the abdomen, preceded the vomiting. The temperature remained normal.

On November 3rd the pulse was beating at the rate of 120. I prescribed bis. carb. gr. x, acid hydrocyan. dil. ℥iij, to be taken in water ever four hours. I also ordered Benger's food, which though not relished was quite well tolerated. Nothing else stayed on the stomach but a little boiled milk. The quantity taken was very small. Day by day the patient grew thinner and the pulse quicker, but all this time the temperature kept normal.

On November 12th I gave by the rectum two raw eggs and two teaspoonfuls of whisky. This was ejected in about half an hour, and repeated when two hours had elapsed.

Early on the morning of November 13th I was called to see the patient. I found that she could not make water. I ordered hot fomentations to be applied at once. When I returned at 10 A.M. I had to pass a catheter and drew off about ten ounces of dark coloured urine. This had to be done again at 6 P.M., and afterwards I gave a suppository of morphine gr. 4. Next day micturition was naturally performed, and I heard that the patient had taken a little more food.

On November 15th I noticed that the patient was slightly jaundiced. The bowels were moving daily, the motions were small, but natural in colour and consistency. During sleep the eyes did not quite close and there was slight conjunctivitis. I gave an enema of tepid water. Vomiting followed almost continually on feeding; small quantities of arrowroot, of Benger's food, of poached egg, and of boiled milk were tried at intervals but very little was retained. The urine was dark in colour, and gave the bile ring with nitric acid. The temperature kept normal, and the pulse varied from 130 to 140.

On November 19th, Dr. Mackintosh (Duns) saw the patient with me. He corroborated my diagnosis of exophthalmic goitre, but thought that the treatment should for the present be directed chiefly against the jaundice. Small doses of grey powder were given but had no apparent effect. Emaciation continued, and I tried in vain to allay the violent pulsation of the blood vessels by painting the epigastrium and precordial region with glycerine of belladonna. No further medicine was given by the mouth. The patient died on November 27th. No necropsy was made.

THE DIFFICULTIES OF PREVENTING ENTERIC FEVER IN WARFARE.

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THE question whether epidemics of enteric fever may be prevented in campaigns was discussed in a letter published in the BRITISH MEDICAL JOURNAL on January 25th. In that letter it was contended that "the prevalence of enteric fever may be reduced in proportion to the completeness and effectiveness of the precautionary and preventive measures which are taken to exclude the possibility of infection"; that "in war the agencies at work for the production and propagation of enteric fever are greatly intensified and increased as compared with the conditions obtaining in civil life, whilst the means of prevention are far more difficult"; that "something more than the ordinary precautions and preventive measures will be required for the prevention of such epidemics"; and that "the difficulties which obstruct the accomplishment of the extraordinary preventive measures required are great and numerous but not insuperable."

Detection of "First Cases."

Even the civilian can realize the great difficulty of detecting first cases amongst soldiers in the field. In addition to the

ordinary difficulty of diagnosing this subtle and protean disease at its onset, the actual specific infection must constantly be masked by the numerous cases of diarrhoea resulting from exposure, fatigue, and diet, etc.

From the outset the medical officer will require all his energy and skill to watch for and detect the invasion of camp, barracks, or moving column by the first cases of specific infection. In some instances the immediate detection may be of the highest importance, and may be the means of saving a battalion or a whole army from epidemic.

Under all circumstances each individual infected by enteric must be regarded as a source from which an incalculable amount of disease will spread unless effective measures are taken to prevent it. Even where the disease is endemic, therefore, it will obviously be something more than a wise economy to give the medical officer a free hand and every facility for detecting these first cases. Obviously, this cannot be done if the Army Medical Service is undermanned.

Direct Infection.

From this difficulty of detecting first cases another difficulty must constantly arise, namely, that of preventing direct infection from man to man, especially in crowded tents, etc.

Very little is heard of direct infection of enteric fever. It is probably far more common than is generally supposed, where sufficient precautions are not taken, or where there is overcrowding. Investigation has shown that, even amongst the medical nurses of the chief London hospitals the incidence of enteric is far greater than the average.

The Commission of Inquiry into the origin of typhoid fever, which created such havoc in the military camps in the United States in 1898 found that out of 1,608 cases, investigated with special care, 563—that is, more than one-third—were "directly connectable," that is, were communicated directly from man to man in the tents. "Certain tents were badly infected, and the majority of all their inmates developed the disease, while other tents wholly escaped."

When it is remembered that a soldier, even in the early stages of the disease, may contaminate his body and his clothing with excretions swarming with the germs of enteric fever, and that he is sleeping night after night in close contact with other highly-susceptible individuals within the crowded tent, it is more difficult to explain how any of his comrades escape infection than to account for the occurrence of one or two cases in the same tent.

The only means by which such direct infection can be prevented is through the prompt detection of the specific disease by the skilled medical officer and the removal of the patient from the crowded tent.

Owing to the difficulties of diagnosis and the prevalence of diarrhoea mentioned above it may be impossible for many days to decide whether the man is suffering from enteric or not. Surely it would not be impossible to set aside certain tents—say one for each company—in which suspicious cases could be quartered until the medical officer can decide whether the man under observation should be allowed to return to his tent or be sent to the hospital. At the same time special care could be given to the removal, and where possible to the disinfection, of the excreta of those men separated for observation.

If every case suffering from diarrhoea—or other symptoms indicating possible typhoid infection—be at once reported and brought under the notice of the medical officer, there is at least some chance of checking the diarrhoea by treatment. Detection of the specific disease would thus be facilitated, whilst many of those invalidated through simple diarrhoea would soon be rendered fit for service. The commanding officer would by these means be relieved to a great extent of the embarrassment caused by the accumulation of men incapacitated by diarrhoea, whilst the best chance would be given for the prompt removal to hospital of the foci of enteric infection.

These measures for the prevention of direct infection, if carried out thoroughly and persistently, would no doubt prevent much death and disablement. It would be a true economy in every way to employ additional medical officers and trained orderlies for this purpose.

Difficulty of Preventing Pollution of Soil.

Another probable source of infection in camps is the polluted soil round about the tents. Owing to various reasons it seems impossible to prevent the custom of urinating around the tents at night. The inevitable consequence is that in the course of a week or two each tent becomes surrounded with a zone richly impregnated with organic matter, a very hotbed for the germs of disease; to this the urine of those infected with enteric could contribute myriads of the specific enteric bacilli. The results of much scientific investigation have failed to prove exactly what happens to these bacilli when implanted in the soil, but the evidence on the whole favours the conclusion that when sown in such a soil they may continue to live to multiply and spread indefinitely. If this be so the tent, its inmates, and contents will almost inevitably become freely contaminated with a dust which sooner or later contains numberless hosts of the disease germs.

In order to prevent the contamination and infection of the tents, except in permanent camps, there seems to be no possible alternative but to shift the camp. In some cases, owing to military reasons, this may be impossible; but, unless there is strong reason to the contrary, it is obviously desirable to shift the camp from time to time, and without delay if enteric fever has developed in it. For the same reasons it must always be a risk to pitch a camp upon a site which has been previously occupied, and nothing less than criminal if enteric fever has prevailed in that locality.

Latrines.

If the *Army Regulations and Instructions* for constructing latrines and for preventing excremental pollution of the camp were constantly and thoroughly carried out in principle and in detail, under all circumstances, there should be little risk of infection from this source, unless the infecting germs are conveyed from them by flies, or (after the excreta have dried) together with the dust. In a country like South Africa, where the drying power of the air is exceptionally high, there can be no doubt that infected faecal matter must frequently be conveyed in the form of dust into the air, into tents, etc., and over the food, unless extraordinary measures are taken to prevent this occurrence. Nor is any proof required to show that the same material will be conveyed and distributed by flies.

In the United States camps in 1898 this method of distribution was actually demonstrated by the fact that "more than once it happened that when lime had been scattered over the faecal matter in the pits, flies with their feet covered with lime were seen walking over the food."

It may be very difficult to prove by direct evidence that outbreaks of enteric are due to this source and convection of the infective material. Many observers consider that there is no evidence in favour of this supposition. But in any case it must be admitted that it is imperative to do everything that is possible to prevent the convection of faecal matters in this manner, and, in many cases, that more than the ordinary precautions must be taken for this purpose.

Preventing Soldiers from Drinking Infected Water.

To those who advocate extraordinary measures for the provision of pure water for soldiers in the field the answer invariably given is, "The soldier will drink anything when he is thirsty—mud, diluted excrement, or any filthy fluid, and you cannot stop him." Under existing conditions and regulations that is quite true and to be expected. An ordinary man when suffering from the agonies of thirst will drink almost any fluid although he knows it may cost him his life, unless he can be sure that within a short time a supply of pure fluid will be provided for him, and unless he has been trained by a long course of discipline to acquire sufficient self-restraint to resist the craving for fluid, and to reserve some portion of the water (or tea, etc.) with which he has been provided early in the day.

That such self-restraint can be acquired is well known to sportsmen, explorers, mountaineers, etc., and has been practically demonstrated by many of our soldiers in the present campaign. In an ideal system of military hygiene this training should be only a part of that sanitary discipline which from first to last should be an integral part of the soldier's life. That such an ideal is attainable, that at some future

time it will actually be attained, there is no reason to doubt, far as we are at present from that consummation. But before this can be accomplished every soldier, from the Commander-in-Chief to the rawest recruit, and, before them, the officials of the War Office from highest to lowest, must be imbued with the true sanitary instinct born of and developed from a knowledge of the simple laws of health, and controlled by recognition of the fact that the most perfect health, vigour, and efficiency can only be maintained by due observance of those laws.

Every recruit from the date of his enlistment must be educated by precept and practice to realize that, in addition to the human enemy in warfare, he has always to contend against a more subtle and more deadly one in the form of those diseases which from time immemorial have decimated armies in the field, and that by breach or careless disregard of sanitary discipline he endangers the lives and efficiency not only of his immediate comrades, but also of his regiment, or even a whole army.

If the soldier is to be educated to abstain from drinking foul water when parched with thirst the abstinence must be made a matter of discipline and training from the first and at all times. During peace, in all manœuvres, route marches, etc., the power of self-restraint must be acquired; the morning draught of coffee or tea is to be supplied, the water bottles are to be filled, and a sufficient quantity of cold water, or of tea or soup, is to be ready for each man at the end of the day's march or manœuvres. In addition to these supplies no drink should be allowed to the thirsty soldier without the assent of the officer in command. The water bottles should be inspected at some prescribed time (just as in case of the "emergency rations"), in order to see that the soldier has not committed a breach of discipline by drinking its contents too soon.

The above suggested measures involve the necessity of providing a sufficient supply of pure or purified water for the battalion or smaller units at the end of the march or of other manœuvres. Let it be admitted that in presence of the enemy this may be a matter of extreme difficulty, and in some cases impossible. That is no reason, however, why every possible effort should not be made to supply the pure water whenever and so far as it is possible.

Water Parties.

Is it not possible to train the "water party"—the three men who, according to the regulations, are told off from each company before encamping—so that they may be expert in finding the best water supplies at hand, and in purifying and distributing the water, and constantly employed (under skilled supervision and control) in carrying out these all-important duties? Let each water party be provided with the best modern materials and appliances for purifying and transporting the water.

Dr. Leigh Canney has shown that one mule may carry the apparatus, fuel (petroleum) and materials by means of which a pint of hot soup, cocoa, or tea may be provided for each of 100 men for four days, the process of boiling occupying only 10 minutes. The American troops in the Philippines have employed the "Waterhouse-Forbes apparatus," weighing only 150 lb., by means of which 26 gallons (208 pints) of water may be purified by boiling, and cooled in one hour. It is reported that this apparatus has been approved by the Surgeon-General of the United States army. These modern inventions are a great advance on the old, and probably admit of still further improvement.

"Kitchen Carts."

Is it not possible that the advantages of the two inventions could be combined, and that each company should be provided with a light "kitchen cart," devised for cooking food as well as for boiling water, drawn by mule, and under the charge of the "water party"? Kitchen carts of this description have for long been employed in other armies (for example, the Russian and Swiss), so contrived that much of the cooking can be carried on whilst on the march. With such provision for each company the camp kitchen would be relieved of much labour, and would require less transport, whilst each soldier could be provided with a pure drink and a warm meal immediately after pitching camp.

It is generally admitted that the infection with enteric fever takes place chiefly in the standing camps. Until, therefore, some such measures as those suggested above have been thoroughly and systematically applied, it cannot be conceded that the difficulties of supplying soldiers on service with pure water and of preventing them from drinking foul fluids are altogether insuperable. The increase of transport required for such a system may be considerable. But there is good reason for supposing that this increase would be counterbalanced, or more than counterbalanced, by the saving of transport, etc., effected through the amount of disease thus prevented.

NOTES ON KITCHEN CARTS AND BOILING APPARATUS.

The Swiss Kitchen Cart ("Cuisine Roulante") Figs. 1 and 2.—Attention was called to this cart as long ago as April 25th, 1885, in an article on *The Swiss Army Medical Service*, contributed to the *BRITISH MEDICAL JOURNAL* by Surgeon-General Evatt. This cart consists of two screwed-down digesters or boilers, beneath each of which a fireplace is fixed, the whole being mounted on a pair of wheels with a strong axle, and supplemented with various accessories for storage, etc. The food is put into the digester and cooked on the march. The adjoining photogravures (Figs. 1 and 2) will give a fair idea of the size and construction of the cart.

Fig. 1.

Fig. 2.

The Russian cooking cart, described and commended in glowing terms by the special correspondent of the *Times* after attending the Russian army manoeuvres in August last,

is similar in construction to the Swiss. It enables cooking to be done on the march. One kitchen cart is detailed to every company, and to the cavalry in about the same proportion. In both of the above carts wood is used as fuel. The construction and details of these carts obviously admit of considerable modification and improvement. Petroleum might be used where other fuel is not available. Above all, part of the apparatus might be employed for purifying supplies of water by rapid boiling.

Dr. Leigh Canney's Apparatus for the Rapid Boiling of Water.—This apparatus was designed for the purpose of supplying soldiers in the field with water which has been boiled and in the shortest possible time. It has been manufactured and patented by Messrs. Ewart and Son, of 348, Euston Road, N.W. (Fig. 3). The apparatus consists essentially of a copper cylinder 18 in. in height, mounted on a light iron tripod stand (s, s), and a petroleum lamp (L). The bottom of the cylinder is involted, and from the bottom 18 "pockets" (not visible in the illustration) project downwards so that the flame of the lamp plays over an extensive

Fig. 3.

surface. The cylinder contains a little more than 6½ gallons—that is, 50 pints. The petroleum lamp (L), made of brass, requires no wick. When it is used the petroleum is driven up through openings at the top of the lamp by means of compressed air, which is pumped in at intervals by means of a metal hand-pump (P). In a trial of the apparatus which we lately witnessed, the 50 pints of water were heated from 46° F. to 212° in thirteen minutes, the quantity of petroleum consumed for this purpose being ½ a pint. In a previous trial during warmer weather the temperature was raised from 55° F. to boiling point in ten minutes. There can be no doubt that this apparatus provides the means of boiling large quantities of water with the aid of portable appliances far more rapidly than any other with which we have been hitherto acquainted. In other words, 50 pints of water may be rendered innocuous in about ten minutes by means of the apparatus, although the water may have been previously teeming with the infectious germs of enteric fever or of other "waterborne diseases."

THERAPEUTIC SKIN-STRETCHING.—Captain George A. Zeller, Assistant-Surgeon U.S.A., describes, says *American Medicine*, a peculiar Bicol practice known as *tangkong*, which consists in repeated skin-stretching on both sides of the neck until tumours are produced. The operation is performed by grasping the skin firmly between the semiflexed index and middle fingers, drawing it out as far as possible and letting go again and again. As the skin is successively stretched it becomes quite elastic, and when it becomes very sensitive a strong salt solution is applied, and the operation is repeated. It is used as a general panacea, but its greatest virtue lies in the relief it affords in severe headache. So universal is the practice that it is rare to find a native without these tumours on the back of the neck. From photographs of a number of native prisoners of war, selected at random from a company, the tumours seem to be as large as good-sized oranges. Leeching, cupping, the application of cataplasms or vesicants, and the employment of the scarificator, are general procedures in most diseases, and most Filipinos are covered with scars on their bodies.