

SANITARY AND INSANITARY MAKESHIFTS IN THE EASTERN WAR AREAS.¹

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NECESSITY is the mother of invention, and war may well be termed the father of necessity, for certain it is that in war man is time and again in dire need. He has to make use of whatever material he can lay hands on. He has to set his wits to work to devise expedients. He has to invent and improvise on the spur of the moment to meet exceptional circumstances, and it must be admitted that his ingenuity is remarkable. If this is true of the combatant, as witness the tanks and hundreds of other marvellous devices, it is equally true, though on a more modest scale, of the sanitarian.

It has occurred to me that it may be of interest to consider some of the makeshifts of the army hygienist in hot climates. I have been privileged to visit all the important tropical and subtropical theatres of war, sometimes I fear as a kind of stormy petrel, and, thanks to Mr. Wellcome—who placed the resources of his Bureau wholly at the disposal of the War Office—I have been able to secure a large number of instructive photographs which will serve as the text of a sanitary sermon. I may say that I was a member of the Medical Advisory Committee which visited Egypt, Mudros, Gallipoli, Salonika, Malta, and Mesopotamia. I then accompanied Major-General Pike, C.M.G., D.S.O., A.M.S., to East and South Africa. Finally, at the invitation of General Allenby, I went to Palestine to see the anti-mosquito operations there.

Like a sermon, the address is divided into heads for, contrary to the usual army view (I am not referring to the army *medical* view), sanitation is a very large subject, and I have no hesitation in saying it is, or should be, the most important branch of medical work in the field. The term "medical," as here used, does not include surgery. It is a trite saying that prevention is better than cure. Everybody knows it, everybody seems to agree with it, but only a minority practise it, and that is why hygiene is, as I have heard it called, the Cinderella of the Medical Services.

Now in army parlance sanitation is still most unfortunately almost a synonym for latrines. It looks as if it would take half a century yet to drive this idea out of the minds of a generation which, thanks to faulty initial education, scarcely yet know how they live, move, and have their being. It is a sad business, for it spells human lives and untold misery and grief and wretchedness; little crosses in lonely places, wrecked homes and a vast burden of expense and inefficiency. Still there seems some prospect of better things, and one looks forward to the day when the sanitary flag will alter its

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(Continued from preceding page.)

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hue and sport a mingled blue and white, the white of purity, the blue of hope.

[Sewage collection and disposal was first dealt with in detail. Various forms of latrines were considered, incinerators, and septic tanks. The next subject under review was:—]

Food and Cooking.

I suppose it seems heresy to say so, but I am convinced that the excellent health of the troops on the Western front is quite as much due to the indefatigable efforts of the Royal Army Service Corps as to those of the Royal Army Medical Corps, speaking for the moment merely as regards the question of transport and distribution of food. I am sure that many officers of the Medical Corps will agree with me. It stands to reason. Feed a man well—that is, give him plenty of good food in sufficient variety, adapted to his racial peculiarities, to the climatic conditions under which he is serving, and well cooked, and in the great majority of cases he will defy not only the Boche but the bacillus. I am certain also that, anti-mosquito precautions and preventive inoculation excepted, good food and proper cooking are more important sanitary measures than any others in the field. Where were they not forthcoming? In Gallipoli, Mesopotamia, and East Africa. What war areas have had the greatest disease incidence, the highest mortality? Gallipoli, East Africa, and Mesopotamia.

To this day it is not fully realised that questions of food and cooking are scientific questions—that the advice of dietetic experts should invariably be sought and followed. If this were done, one would not see ration scales for native African troops devoid of substances essential to life and health—one dietary without sugar, another minus vegetables. It seems scarcely credible, but it is true.

Now cookhouses are important places. In the earlier stages of the war everyone tried to make cookhouses flyproof, with the result of converting them into flytraps. Anyone who was at Mudros will confirm this statement. It is no use employing wire netting in a cookhouse unless you have double doors, can execute instant repairs, and can post a sentry to shoot those who put stones under the doors to keep them open. No, a cookhouse must be well ventilated, as dark as possible, and its door should face north in the northern hemisphere and south if it is on the other side of the equator. All this sounds trivial, but at Lindi, in East Africa I saw a cookhouse on which many pounds had been spent, and it was worse than useless. On the other hand, I saw a fenestrated mud-brick cookhouse, of most excellent design, near Jaffa. It is a new and original pattern, well worthy of adoption, the invention of Lieutenant-Colonel A. L. Otway, R.A.M.C.

Much ingenuity is often displayed in the construction of open-air kitchens and field ovens. The same is true of field bakeries—most important institutions in which very often wonderfully good bread is baked. Believe me, good bread often means good health, for, as you know, bread is the "staff of life."

I direct attention to the plan of an underground larder used by a crack cavalry regiment in Mesopotamia. (Fig. 1.) While their comrades spoiled their teeth and their tempers on tough meat, this unit enjoyed tender roasts and stews throughout the fiery heat of a Mesopotamian summer—a fitting reward of enterprise.

Professor W. J. R. Simpson, at the last meeting of the Society, paid a tribute to our gallant allies, the Serbians. I saw a good deal of these fine peasant soldiers just after they reached Salonika from Corfu. We had a great deal to learn from such veteran campaigners. While our men too often "pigged it" in their tents—many units at that time having no mess marquees or huts—the Serbians dined in comfort at stone tables under an awning of tree branches, which they collected from a place eight miles away. They had dining-tables and serving-tables made of stone, and also officers' dining-table and seats of wicker- or basket-work, both comfortable and picturesque.

Water-Supplies.

Lack of space prevents any reference to the hundred and one contrivances for dealing with sullage water in hot countries. Of more importance is the question of water-supplies and of water purification. The sources of supply varied greatly on various fronts. Egyptian filtered water, brought by tank steamers, was the chief supply in Gallipoli;

in Salonika, mountain streams were often a source; in Palestine, the sources varied from the beautiful "Springs of the Sultan," near Jericho, to the clear waters of the rapid Anja river, which flows into the sea near Jaffa, and included the new reservoir supply for Jerusalem, gathered from the hills about Bethlehem. In Egypt, the Nile and its canals furnished the supply and brought risks of bilharzia; in Mesopotamia, a dry and thirsty land, the Shatt-el-Arab, the Tigris, the Euphrates, the Karun, and surface wells yielded their waters, sometimes with the cholera vibrio in them; in East Africa, men drank from rivers and from water-holes, from mountain streams and from wells, and ran many risks in consequence, for the makeshifts devised for protection were too often well worthy of the name.

Let us look at some of them and at methods of collecting, transporting, storing, and purifying water on various fronts. Putting a strand or two of barbed wire round a water-hole and placing a native sentry on guard over it are measures of slight utility, though better than nothing. Where possible, a high fence should surround the spring or pool, with a hole in it through which the collecting hose passes. This was



FIG. 2.—Well-protected "spring" water-supply at Summit, East Africa, showing hose leading to water-tank.

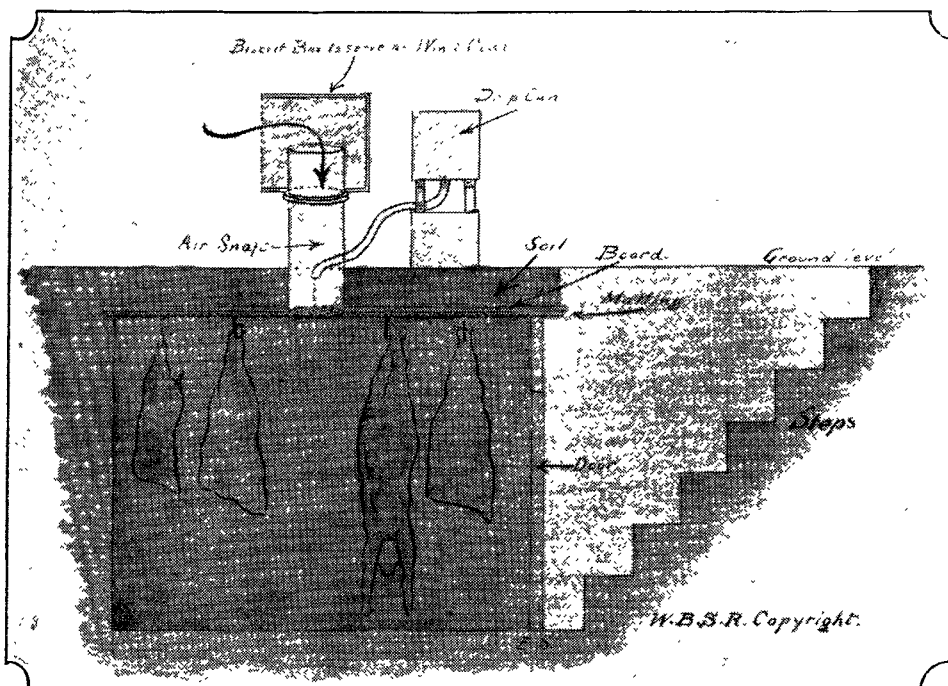


FIG. 1.—Method of keeping meat and ensuring that it was tender, employed by a cavalry regiment in Mesopotamia.

done at Summit, on the Mikese-Rufiji road, in East Africa, and answered excellently. (Fig. 2.) At Amara, in Mesopotamia, the admirably protected well areas with covered wells were one of the sanitary features of the place, and a tribute to the Royal Engineers.

The only special device for collection which I will mention is the use of the huge fruits of the baobab tree as pitchers when drawing water from wells. Methods of pumping, more or less elaborate, are shown on the screen.

Storage is often a troublesome business, especially in a country like Mesopotamia, where for a long time transport was a great difficulty. That is one reason why large rubber canvas troughs, each holding 2300 gallons, came into use. (Fig. 3.) Their only drawback was that they were not covered. Tanks hollowed out in the soil, lined by tarpaulin and covered with canvas, were common in the Advanced Corps Area in 1916. I have seen drinking water stored in a German shell-case, which makes an excellent receptacle. Unfortunately, someone had placed the long metal cylinder in the blazing sun and the water was scarcely refreshing. Even makeshifts must be properly used. A very bad type of watertrough was the canvas diggie made in Basra—a clumsy, heavy, leaking arrangement.

Water was transported in many ways: by carts, in pakhals and fantasses, on mules and camels, in bags, in petrol-tins as at Anzac—a weary business, but I do not recall any very novel devices, save the use of iron telegraph poles as pipes at Sheikh Saad in Mesopotamia, and of split date-palm trunks as water-gutters.

Purification of Water.

In some places I have seen river water boiled in petrol-tins on the bank, and all the good of the boiling vitiated by the

transport people plugging the openings in the tins with bunches of grass or reeds—a very insanitary makeshift. On the other hand, an Indian hospital had an admirable arrangement whereby water was sterilised in special boilers and gravitated by tin channels to metal receptacles. At Port Amelia, in Portuguese territory, a British hospital adopted the principle, but placed the receptacles uphill from the boilers, and so the boiled water had to be carried up to them by hand, an element of risk being thereby introduced. As has been truly said, common sense is rare sense.

Two makeshifts for preparing good emulsions of chlorinated lime are worth noting, both employed in Basra. The earlier one consisted in Indians violently shaking Winchester quarts filled with the solution; the latter was represented by ingenious hand-churns, and worked very well. (Fig. 4.)

Elaborate improvised labyrinths were at one time in vogue in the Suez Canal zone to ensure a thorough mixing of water with alum, and thereby a satisfactory precipitation prior to filtration.

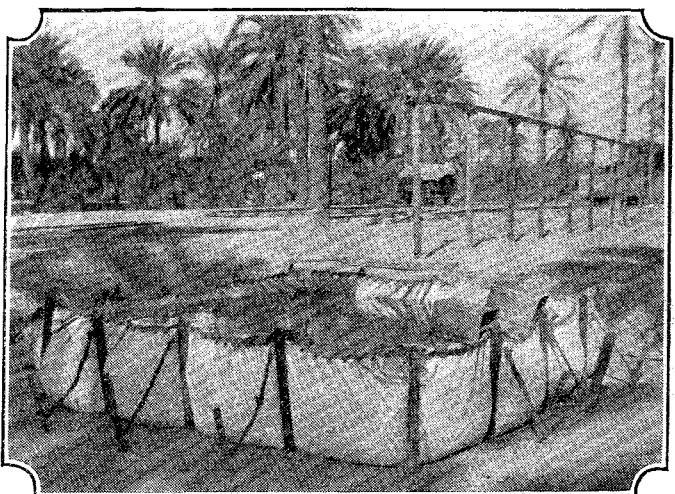


FIG. 3.—Rubber canvas for holding drinking water. These canvas tanks hold 2300 gallons.

The design reminded one of the maze at Hampton Court. A sergeant-major at Amara effectually prevented thirsty souls from drinking out of a tin dipper, and thereby possibly contaminating a water-supply, by serrating the edge of the tin; while a good method of cooling water employed in Macedonia was to surround a water-tank with sandbags, which were kept wet, an air space being left between the bags and the tank.

Bathing and Washing.

Great ingenuity was often shown in the construction of shower-baths, but nowhere more so than in the Corps area

in Mesopotamia, where the absence of wood and stone resulted in certain remarkable tin structures. The simplest makeshift, however, was at Morogoro, in East Africa, where by hollowing out the ground a stream was made to cascade and thereby supply a splendid douche. The damming up of natural watercourses often resulted in the provision of excellent baths (Fig. 5), and a fine swimming-pool was created

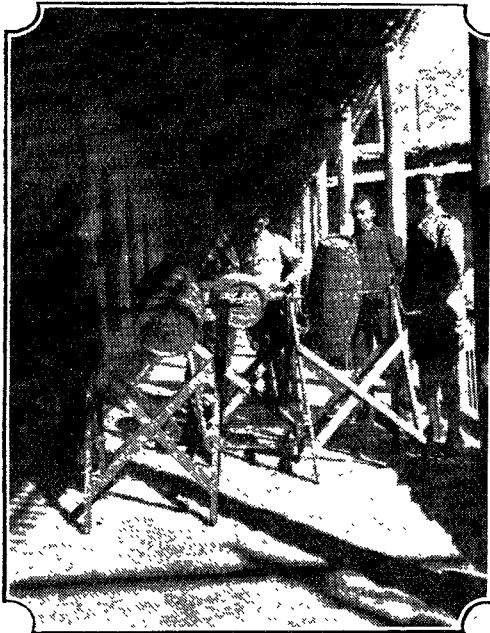


FIG. 4.—New method of preparing chlorinated lime solution for water sterilisation by use of churn.

on the Victoria Nyanza with half cocoa-nut shells came as a revelation to me, and is probably new to most.

Disinfection is closely allied to bathing and includes the destruction of vermin. The simplest makeshift for dealing with clothes lice is probably the oldest—the picking method—carried out either by the sufferer or a friend. But we can do better than this in the army, and the methods varied from the Serbian barrel to the most useful railway van disinfector, which of all devices I have seen accomplishes most in the shortest time, as can be seen in Colonel William Hunter's articles in THE LANCET for Sept. 14th and 21st, 1918. Both these useful methods owe their introduction to Lieutenant-Colonel G. E. F. Stammers, R.A.M.C. Now the Serbian barrel is often wrongly used. What is the use of



FIG. 5.—Improvvised bathing place, Macedonia, formed by damming up the course of a mountain stream.

placing it on a hillock and having to climb up to it every time soldiers' kits have to be popped into it? Again, why do so many people neglect to see that the water-tank, the source of steam, is so placed below the barrel that the largest available evaporating surface is provided? Success in sanitation depends largely on attention to detail, and very often this is not forthcoming. The so-called Levisseuse apparatus, which is a kind of metal Serbian barrel, has such a limited holding capacity that it is not much use.

A barrel may be used for holding disinfectant outside a latrine. It should be accompanied by a nail-brush fastened to a wire. One medical officer actually arranged a latrine in such a way that once in it a man could not emerge without dipping his hands in a disinfectant solution which effectually camouflaged the latch of the door. I fear the plan was more ingenious than effective.

A very insanitary makeshift for getting rid of dead animals on the road was too often in vogue in East Africa—namely, leaving them there till the flies and the vultures made an end of them. I saw a carcass where, it is true, an effort at charring had been made, but in which the main disinfection was that whereby Herod Agrippa ceased to be a nuisance, for this dead horse was being "eaten up of worms," or rather by the maggots of *Pycnosoma* flies.

Fly Destruction.

I do not like to call any invention of my own a makeshift, but would like to direct attention to the open-air cage fly-trap (Fig. 6), and to its modification by Captain F. Rose. Both these models work well when properly baited and operated. This is not the case when medical officers construct them so as to catch sparrows as well as flies, or alter

them according to views which effectively ruin their efficiency, or pay no attention to them after the first excitement of trapping several thousand flies is over. Here are the rules which must be followed if these traps are to be a success:

1. The calico or canvas forming the greater part of the sides of the trap should be stretched *tightly* on the framework.

2. The slit between the wire mesh and the alighting board should be just large enough to allow a bluebottle fly to enter the trap.

3. The trap should, as a rule, be placed in the sun out in the open.

4. It should be placed outside a mess or cookhouse, or near a latrine, or between an occupied tent or camp and any source of flies.

5. It is essential that it should be properly looked after, especially as regards baiting.

6. For this purpose it is best placed under the charge of some one person who will be responsible for keeping it in repair, baiting it properly, and cleaning it.

7. Any attractive bait may be employed, but one of the very best is chicken entrails. Human faeces may be used if placed in a tin carefully covered with wire gauze, so that the flies cannot get access to the contents. Other baits are: raw meat, cheese paste, stale beer, bread soaked in vinegar water, jam, marmalade, lentil paste with a little sugar sprinkled on it, old melon rinds, fruit and fish refuse.

8. Flies in the trap are best killed by having a poison solution such as formalin 3 per cent., made up with lime water, arsenite of soda syrup, or sodium fluoride. Whatever poison is used it is best placed in a covered tin through the lid of which wicks protrude. These wicks dip down into the fluid or syrup which they suck up, and the flies imbibing the poison from them speedily die.

9. Failing poison, the flies can be killed by spraying with spray oil or some similar preparation or by fumigation, the trap being covered over with cloths or blankets during the fumigating process.

10. A record should be kept of the daily catch; this may be done by weighing the flies or seeing how many will go into a receptacle of known capacity. A pint measure holds about 10,000.

It is perhaps news to many that a tangle-foot fly-paper is much more efficient if used in the form of an arch. (Fig. 7.)

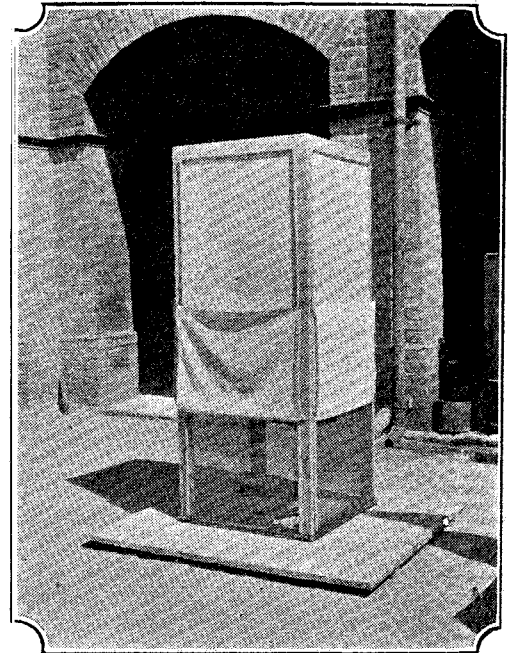


FIG. 6.—Latest type of cage fly-trap, in use at Basra.

This has probably something to do with the way the light falls upon it, and an apparatus has been devised for holding such curved papers. The roller-towel method of using arsenite of soda solution is an excellent makeshift arrangement, and with a minimum of attention ensures a constantly damp, poisoned surface for the delectation of our enemy the fly. (Fig. 8.)

At Nasiriyeh, on the Euphrates, Major W. S. Patton, I.M.S., has introduced Roubaud's method for destroying fly eggs and larvæ in horse manure. The heat of the manure is used as a

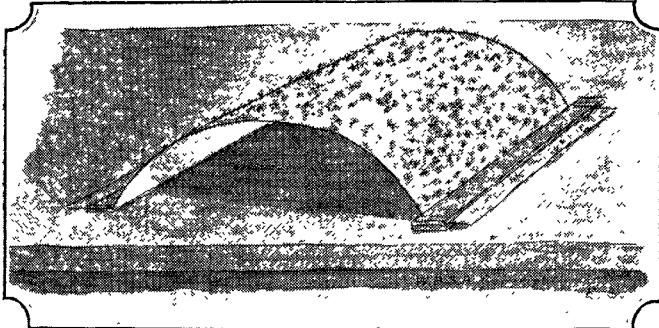


FIG. 7.—This arched form of fly-paper is found to serve as a more efficient trap.

lethal agent. Another device, which served to free a large hospital at Potchefstroom altogether of flies, was introduced by Lieutenant E. Baber, S.A.M.C., and has been described in THE LANCET for March 30th, 1918. Here the larvæ migrating from the heap were trapped in gullies and destroyed, and any flies which happened to breed out found leafy branches soaked in arsenite solution conveniently placed for their refreshment and rest, the latter of the eternal variety.

Buildings.

Lastly, a few words as to buildings. By far the most ingenious makeshift hospital ward I ever saw was the fenestrated mud-brick erection constructed by Lieutenant-Colonel Otway, R.A.M.C., of the 130th Combined Field Ambulance, on the road running north from Jaffa. Thanks to the use of mosquito mesh on the inner side of the fenestrations, and also over the doors and windows, this ward was absolutely free from flies and mosquitoes. It was partly hollowed out of the ground, but the portions left as bedsteads were of such a height that the patients lying on them could look out of the ward and see all that was passing. There was plenty of light and yet it was refreshingly cool. As I say, I never saw anything like it, and it deserves very honorable mention.

Some of the thatched bandas used as wards in the carrier hospitals in East Africa were truly works of art. Those in No. 1 Carrier Clearing Hospital at Iringa were really beautiful buildings and most comfortable, reflecting the greatest credit on

Major Roberts, R.A.M.C., and his experienced architect, Staff-Sergeant Eales, S.A.M.C.

A trellised grape vine in a monastery close to the Jordan formed quite a good makeshift ward for the patients in an Indian Cavalry Field Ambulance, while I would direct attention to the curious little shelters for cerebro-spinal contacts employed at Dodoma in East Africa.

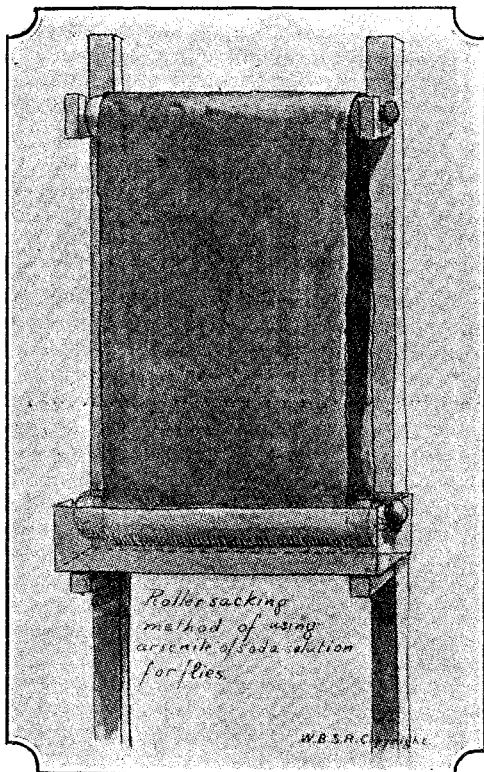


FIG. 8.—The trough in which the sacking dips contains the poisoned solution.

A method of warming a tent by a stove and chimney was in use on the Karun Front in Mesopotamia; and at Amara the remarkable huts of the British Convalescent Depot dug out of the soil, roofed with reeds and provided with lateral ventilating shafts, were admired by all who saw them, and used by as many as could get into them.

Finally, I may remark that no one who was ever inside the famous sandbag bacteriological laboratory, tucked away out of shell-fire at the base of the cliffs at Cape Helles, is likely to forget it, and that the remembrance of the huge packing case which had once held an aeroplane doing duty at Dar-es-Salaam as a hospital laboratory is not likely to fade.

The Claims of Sanitation.

I think I have said enough to prove that the army sanitarian has plenty of ingenuity, even if it is at times wrongly applied. Believe me, he has need of it, for he is often left in the lurch. Why is this the case? There are several reasons, but one is that the sanitarian has to go cap in hand to the Ordnance Department or the Royal Engineers and beg for material. Sometimes he will get it at once, sometimes after a long time, very often not at all. Let me tell you a true story which speaks for itself:—

A New Zealand medical unit on a certain island was badly in need of wood for sanitary purposes. Requisition after requisition failed. Finally, the Commanding Officer said to his Quartermaster, "I want you to indent on the Ordnance for a large supply of wood to make tombstones."

"Tombstones!" said the Quartermaster, "what do we want with tombstones?"

"Never you mind," was the reply, "do as I tell you."

Next day a cart, laden with wood of all shapes and sizes, made its appearance. There was plenty for the dead. There was none for the living.

Naturally enough the Engineers, a very busy and capable corps, scarcely realise the paramount claims of sanitation. Like Martha, they are occupied with many things, and latrine construction does not usually appeal to them, nor do they always understand what is meant by efficient protection of a water-supply. As I have said elsewhere, things will not be right until the Royal Army Medical Corps has affiliated to it a body of expert sanitary engineers, under its own control, to carry out the minor sanitary works which are so important. I know there are difficulties in realising such a scheme, but I believe they can be overcome.

In common with many of you, I have the honour to belong temporarily to the Royal Army Medical Corps, and I have seen again and again how the efforts of that corps are frustrated by its dependence on other departments. Too often it gets the blame when it is not blameworthy. Grant it a greater measure of autonomy and you will see what it can do. They say medical men are not, as a rule, good administrators. I deny that assertion. What are the qualities of a good administrator? Foresight, tact, discretion, firmness, energy, and sympathy. What is prognosis but foresight? What is tact if a doctor does not learn it in dealing with his patients? Discretion is surely drummed into the medical man from his student days. He may not always be firm, but his experience at least teaches him to stiffen his back if he is to save life. Few men lead more energetic lives than the medical student, while sympathy is surely the hall-mark of our profession.

No, the doctor can administer if he only gets a fair chance.

A Plea for the Better Recognition of Hygiene.

At the same time I do not think that hygiene is yet priced at its proper value. I would advance a plea, an urgent plea, for its better recognition. Rightly or wrongly, decorations play a great part in army life. When a regular officer is introduced to a stranger in khaki, in nine cases out of ten his eye wanders first to the spot where what has been called the "herbaceous border" flourishes! He will never there see anything associated with sanitary work—I mean it has no distinctive reward. Comparatively rarely indeed has it any reward at all.

And yet the disciples of the goddess Hygeia—be they in the humblest or the highest positions—contribute greatly to the success of our arms, more especially in tropical countries. They have hard work, constant work, often dirty, dangerous, and repellent work. Doubtless it is sufficient honour and reward to labour for the sake of the Empire; but when so many distinctions are conferred, is it asking too much that the claims of the sanitarian should be considered, not, mark you, for his own sake, but to impress upon those ultimately

responsible the fact that army hygiene is a very important section of army life?

Our friends the French are a wise and practical people—the French Army has such a distinction. I understand it has been cheapened; but I maintain the principle is sound, and the recipients of any such honour should not be limited to the Medical Service, but should be chosen wherever an officer or man has shown conspicuous zeal and energy in furthering sanitary measures. There are many other questions of pay and rank, and, I may add, as far as sanitary sections are concerned, of mobility, but into these I may not enter.

I would only say that if ever the above suggestion—which I advance with considerable diffidence, and only because I am certain it is on right lines—if ever, I say, it bears fruit, then I hope the ribbon chosen for the decoration will bear the same colours as the flag of which I spoke—the white of purity, the blue of hope.

THE TREATMENT OF GENERAL PARALYSIS OF THE INSANE BY THE INTRODUCTION OF SALVARSANISED SERUM INTO THE LATERAL VENTRICLE

AND A SUGGESTION FOR THE ARREST OF TABETIC OPTIC
ATROPHY BY THE SAME MEANS.

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IN THE LANCET for May 30th, 1914, each of us published a paper on the introduction of salvarsanised serum into the cerebro-spinal fluid. These papers were based on three cases of general paralysis of the insane in which salvarsanised serum was introduced into the lateral ventricle. The first case was that of a musician: a violin player who had lost the power of using his instrument and the memory of 400 tunes which he was accustomed to play. This first case is still alive and apparently cured. He has returned to his profession of violin playing in a London orchestra, though he is not quite so expert with his instrument as before the onset of the disease. This could not be otherwise since brain cells once destroyed cannot be replaced. It would appear, therefore, that there are grounds for holding that the treatment adopted in this case did arrest the disease and did restore this patient to such a state as now enables him to earn a living. The serum was introduced on two separate occasions (at short intervals) into the lateral ventricle. The first occasion was on March 25th, 1914, so that five years have elapsed since the treatment was carried out. No bad effects have so far followed the operation. The operation as an operation appears to be free from danger.

The Argument.

It is known that *Treponema pallidum* is very sensitive to the antibodies in the blood and to remedies which probably have a direct action on it. The object, then, to aim at is to introduce salvarsanised serum into the cranial cavity in such a way as will admit of the serum coming into contact, by the shortest route, with the brain cells which are in danger of destruction by the syphilitic virus.

There is a general belief that, while antisyphilitic remedies are useful in interstitial syphilis, they are quite ineffective in the lesions of parenchymatous syphilis (i.e., in general paralysis and in tabes dorsalis), in which the parasite would appear to be located between the individual neurons. There is good evidence that the injection of salvarsanised serum into the subarachnoid space of the spinal theca has been followed by improvement in certain early cases of tabes. It may be regarded as certain that the injection of the serum into the spinal theca in general paralysis of the insane is less efficacious than in the early stages of tabes. Is it not fair to hope that benefit would follow the introduction of salvarsanised serum into the subarachnoid spaces of the brain in early cases of general paralysis? The essential points are (1) that the serum should circulate in the peri-neuronic spaces of the brain where the spirochætes reside, and (2) that more salvarsanised

serum can be inveigled into these spaces by the intra-ventricular method than by any other.

Pathology.

As regards the pathology of general paralysis of the insane, it would appear that at the commencement of the secondary stage of syphilis the spirochætes are conveyed by the blood-stream all over the body. Some may gain access to the brain, where they may remain dormant for years. Should they become active the process of general paralysis of the insane is set on foot, and it is at this early stage that treatment should be begun.

Diagnosis.

Unfortunately, cases of general paralysis are rarely diagnosed before the cerebral cortex has undergone extensive disorganisation, so that even if we succeed in arresting the disease at this stage some mental defect is inevitably left. We want to be able to diagnose the disease at the very beginning—in the pre-clinical stage. It is here that the investigation of the cerebro-spinal fluid affords valuable help. In this connexion the following facts are worthy of note.

So long as the central nervous system is not infected by the spirochæte, giving rise to interstitial or parenchymatous syphilis, the cerebro-spinal fluid gives a negative Wassermann reaction, owing to the fact that the capillaries of the central nervous system (those of the choroid plexus among others) are impermeable to the Wassermann substance.

It is quite common to get a positive blood reaction and a negative cerebro-spinal fluid reaction.

A positive reaction of the cerebro-spinal fluid is thus proof positive that the central nervous system is infected with the spirochæte.

When the cerebro-spinal fluid gives a positive reaction the blood generally does so too. This is as we should expect, seeing that the fluid drains off into the general blood-stream.

In rare cases, however, the blood reaction is negative when that of the fluid is positive.

In general paralysis both the fluid and the blood give a positive reaction in practically every case.

If we find the blood negative the chances are nearly 100 to 1 that we have not to deal with a case of general paralysis, but if there is any doubt the fluid should be examined, since in very rare cases of general paralysis the fluid may give a positive reaction, while that of the blood is negative.

In the case of interstitial syphilis of the nervous system we may hope to render a positive reaction of the fluid negative by administering mercury and the salvarsan group of remedies through the blood.

In the case of parenchymatous syphilis of the central neurons this is much more difficult; with general paralysis it is impossible.

By introducing salvarsanised serum into the spinal subarachnoid space a positive reaction of the fluid can be rendered negative in the case of tabes dorsalis.

By introducing the serum into the cerebral ventricles we may hope for a similar result in general paralysis.

Examination of the blood.—The only way to detect parenchymatous syphilis in its earliest phases is by periodic examination of the blood and fluid. The blood of a syphilitised person should be examined yearly. Supposing it to be positive, salvarsan should be given intravenously. If the blood reaction remains positive after rigorous treatment by salvarsan and mercury the cerebro-spinal fluid should be tested. If the fluid is found to be positive, early parenchymatous syphilis may be suspected and treatment be pushed by injecting salvarsanised serum into the spinal theca. If after this treatment the fluid remains positive, then the possibility must be seriously considered of the development of general paralysis, and the nervous system must be subjected to a searching examination for clinical evidence of this disease.

In all the great emergencies of surgery early diagnosis alone can lead to early and successful operation. Appendicitis is a good example, but no emergency can be more urgent than that which has for its object the saving of the life of nerve cells, above all those of the cerebral cortex. The method proposed can only be fully effective in the very earliest stage of disease before extensive damage has been done to them. We repeat that the pre-clinical stage of syphilitic brain disease is the ideal time; indeed, one might say it is the only time for the commencement of curative treatment. Clinical experience offers many examples of the course of the stream of the cerebro-spinal fluid. For example, in fulminating subarachnoid meningitis, spreading