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ESSAY ON MEDICAL ARRANGEMENTS IN WAR.

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(*Continued from p.* 471).

MEDICAL ARRANGEMENT.

THE next link in the chain is the Field Ambulance. For the work of this unit the light dooly should supplant the stretcher, because it can be carried farther, faster, and with greater comfort to the wounded man. No attempt should be made to combine the functions of bearer and dresser. The highly educated dresser has not the physical training to make an efficient bearer. The hands of the bearer are roughened and hardened, and quite incapable of sterilisation. To get the maximum of efficiency the bearer should do nothing but carry, and should be in hard training for his work, and the dresser should do nothing but dress, and should keep his hands in a fit state for it; on economic grounds the dresser is too expensive a man to be wasted on mere muscular labour. Each dooly should have six bearers, four to carry and two relief, and one dresser. The men available for bearers are: (1) Men of the Volunteer or St. John's Ambulance. (2) Ordinary civilians engaged for this special work. (3) Natives of the country in which the war takes place. (4) Indian "Kahars." The first two have had no physical training in the work, and their services can be better utilised elsewhere. The third would be expensive, and, unless

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enrolled and trained beforehand, would be lacking in discipline, and hard to handle, as well as very inefficient bearers. The services of the fourth would probably have to be utilised to some extent on the outbreak of war; they might be good, bad, or indifferent (probably the latter), but their training would of necessity be hurried and perfunctory. The "Kahar" has many advantages, and I believe that the Gharwal "Jampani" is the best man for the purpose in the Empire. He is quite as accessible as the Englishman, and can be even more easily transported to the scene of action. He is much cheaper, both as regards pay and the transport required for his kit and tentage. He understands living in the open, is hardy, frugal, and amenable to discipline, and he is accustomed to carry heavy loads over the steepest ground. He could be taught in a few days to lift wounded and load the dooly, and all else that is of practical value he knows already. Of course, the drill would have to go, to a great extent, but it is about as useful in modern war as the old attack in column of companies, and there has been practically no drill in advance of the wagons on the field of battle for the past twenty-five years. The superior carrying power of the native may be doubted by some, but I do not think we have a man in the Corps who could carry a 40 lb. load twelve miles over rugged mountain country in a day; whereas any Gharwal coolie picked at random, would not only carry an 80 lb. load for that distance, but, for an extra rupee, would joyfully walk back to report its delivery.

The employment of these men, equipped with doolies under 40 lbs. in weight, would greatly increase the efficiency of a field ambulance. For hill warfare on exceedingly precipitous and difficult ground, neither dooly nor stretcher are much use, but a light net hammock stretched on the dooly pole will bring a wounded man down from all but the very worst places. The sides are tied up at intervals, so that the patient is practically lashed to the pole, and in this way he can be safely passed from hand to hand down very bad places, indeed, in far greater comfort than if carried in a coat or blanket. In exceptionally bad places it may be necessary to fix him on a bearer's back and assist the latter with a rope, or even lower both together. For this purpose a piece of stout fabric 92 inches long by 24 inches wide is split for 28 inches and the ends turned back for 21 inches, and sewn firmly across the width of the stuff, so as to leave two loops, through which the bearer's arms are thrust; the opposite end is split for 27 inches, and the two strips thus formed are sewn end to end, so as to form a single loop 27

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inches long. The stuff is then folded in three at this point, so as to reduce its breadth to 4 inches. When the patient is placed on the bearer's back this loop is passed between his legs, drawn well up behind his back, passed over his head and arms, and lastly across the bearer's forehead. The wounded man is thus supported at the buttocks and under the armpits with his weight distributed to the greatest advantage for the bearer, whose hands are free for climbing or fending off his helpless burden from rocks while being lowered. There is no place into which a mountaineer could climb that four Gharwal coolies with this simple apparatus and a piece of rope could not get him out of, if wounded. The English bearer, Royal Army Medical Corps or other, could not go on to such ground at all. For the longer distances, too, our means of transport are not sufficiently flexible. In Manchuria wheeled ambulances were found useless; and we may at any time have to fight over as difficult a country.

Our present Resources — Cacolets and Stretchers.—The cacolet is a practical and useful though somewhat tiring conveyance for sick and wounded who are able to sit up, if carried by a camel, but it is too heavy for the ordinary mule and will soon soreback a large one. Each cacolet should have a water bottle and an umbrella in a light sheath as permanent parts of its equipment on service.

For helpless cases there is nothing but the stretcher. To carry it for ten or twelve miles is a practical impossibility, unless it is slung as a dooly, when it becomes merely a very inferior dooly.

The long pole litter borne by two mules in Indian file, was found practical, and not uncomfortable, by the Russians in Manchuria, and where a sufficiency of mules or pack horses, or even camels, could be obtained, it might be of great value. At any rate, the choice appears to lie between it and the dooly for transporting helpless sick over a difficult country.

It would be not the least important of the duties of the Special Service Officer mentioned above, to prepare beforehand details of the particular forms of ambulance suited to the different parts of his district, remembering always that the severest fighting is likely to take place in hills and broken ground, rather than in open plains.

Between the Field Ambulance and the rail, or river, a service of motor ambulances would be admirable, if good metalled roads were available. The motor does not get exhausted and eats only when at work, but, alas, it soon shakes itself to pieces over bad roads, and especially so on solid tires. It cannot work over loose sand, mud,

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or swampy ground, or ford rivers, and its use in war would be very limited indeed, outside the continent of Europe.

The Advanced Stationary Hospital, immediately behind that newly consolidated unit the "Field Ambulance," will have to partly assume the functions of the old field hospital. It must be pushed well to the front, and will, therefore, be often forced into positions where it will not be permanently needed. Although by regulation equipped for 200 beds, it is, in actual warfare, the most protean of all the field medical units, and must assume practically any size required by the exigencies of the moment. With severe and continued fighting going on in its immediate front, or on the occurrence of an epidemic, it may (especially if at a distance from a line of rail) be rapidly expanded to 400 or 500 beds, and be obliged to undertake, more or less, the continuous treatment of the sick. Should the situation render such a course advisable, it may be formed into a fully equipped general hospital and so become fixed. On the other hand, as its uses pass away, it may shrink to its normal size and finally vanish, to reappear at the new front in its original form. Or it may simply remain where it is and become a line of communication hospital—a "stationary hospital" in reality.

It must be well equipped with surgical instruments and materials, since it must undertake all absolutely necessary operations; and have a large stock of medicines, to allow of rapid increase in the number of its beds; also the officer in charge should have full power both to purchase supplies and employ local labour when required.

The tentage of this hospital should afford good protection, but should not be too heavy. The Hubert tent has been suggested. I have no personal experience of this tent, but the kanats seem too low, and, at the weight, there can hardly be cloth enough in the roofs to afford protection against a really hot sun. The Cabul service mess tent, 18 feet by 12 feet with 4½ feet kanats, weight 400 lbs., is light, easily pitched, and affords excellent protection. Its size could be increased to 20 feet by 16 feet for a weight of about 500 lbs., thus giving the accommodation of the I.P.E.P. tent at about half the weight. Two of these tents pitched end to end, 8 feet apart, with a double roof of cloth slung to a connecting ridge pole between them, would take twenty beds for a total weight of about 1,100 lbs. This would be light enough for a "stationary" and good enough for a "general" hospital.

A bed cot 30 inches wide, with spring bottom, and legs and frame of steel bicycle tubing, legs and head rail to fold flat to

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frame, could be made of ample strength at a weight of 21 lbs., and would be well adapted for use in both stationary and general hospitals. All utensils, cooking pots, &c., should be made of aluminium. The first cost would be considerable, but would be saved in transport. Unless the climate is so rigorous as to leave no option, it is not advisable that these hospitals should occupy existing buildings. These are rarely suitable, or sanitary, without more alteration than there is time for, and when a hospital gets into a permanent building it is somehow very hard to get it out again. Each stationary hospital should have permanently attached to it, one ambulance waggon, one general service cart, one light cart, and two water carts. It should also have at least six wheeled stretcher carriages and a large reserve of field doolies.

The object of the General Hospital, at what may now be called the advanced base, is to afford every practical facility for operation, treatment, and nursing, possessed by a first class civil hospital at home, in order to expedite the recovery and return to the fighting force of every possible man in the shortest possible time. If the climate is good, and supplies obtainable, none but the hopelessly broken down or crippled should pass coastwise through this great strainer; all others should be cured and returned to the ranks through convalescent depôts, which should be established as near the front as circumstances permit. The further a sick man is allowed to go to the rear, the harder it is to get him back, and the less relish he has for fighting when he does get back, added to which in going and returning he cumbers the line, which is badly needed for other purposes.

With these objects in view, the use of huts or tents for the wards of this hospital is not a matter for academic discussion, but of climate. In great cold, huts, and double walled huts, or even more substantial buildings, may be a matter of vital necessity. In a heavy jungle country, huts well raised off the ground, as in the Burma military hospitals, will probably be greatly superior to tents, and the materials for them will be at hand. In moderate climates, on clean, open ground, good tents are perhaps preferable to anything else. It is a purely local matter, and must be decided as such, always remembering that this is practically a fixed hospital, and that in its plan and construction, every effort must be made to place its sick under the best hygienic conditions possible. Its *personnel* should at first consist, almost exclusively, of Royal Army Medical Corps officers and men and Army nurses, but as the war progresses and the services of these are required at more advanced hospitals, some

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of them may be replaced by civilians. The proportion of the latter should, however, never be allowed to exceed 50 per cent.

The lighting of this hospital should be good. If a dynamo is available electricity is most suitable, but acetylene is portable, easily managed, gives a beautiful light, and in a country where fuel was scarce, and the power to run the dynamo absent, might be used with advantage.

Efficient sterilisers should be provided for drinking water: under the conditions of active service no filter is to be trusted. Also for all excreta. The dry-earth system has been greatly discredited of late years, and the sterilisation only of dejecta which are *known* to be infective is a very partial protection. Even if the dry-earth system was all that was at one time claimed for it, there may be no earth available in many situations.

A laundry should be established, and should be under the entire control of the medical officer in charge. If possible, a railway siding should be run into the hospital. It saves the patients much discomfort, saves transport, labour, and loss of time, and clears the main line of stationary hospital trains, and the main line platforms of doolies, stretchers and waiting bearers. Unless the levels are very bad, such lines are easily laid, as the speed over them need never exceed five or six miles an hour, and the rails need only be spiked to sleepers, not laid in chairs. If this is done, one ambulance waggon, two light carts, and two water carts should be sufficient transport, permanently under orders of the medical officer in charge.

Twenty beds are set aside for officers, and specially dieted. If the hospital be expanded to more than 520 beds, the number of beds for officers must be proportionately increased, but if two or more general hospitals are established near each other it is better to unify this accommodation, and form a separate hospital for officers, in order to simplify dieting and nursing.

It is very important for the treatment of the sick, that the health and good spirits of their attendants should be maintained at the highest level. A gloomy man, however hard working he may be, is a depressing factor in the wards, and the natural irritability consequent on a low state of health due to monotony and unrelieved mental strain, is conducive neither to good discipline nor good nursing. The more highly we educate our men, the more they will feel this strain, and every effort should be made to lighten it as far as possible. Men are far more quickly broken down by petty discomfort and dull unvarying routine than by hard work.

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They should be provided with better tentage and more means of recreation when off duty. I have lived in tents of many patterns, and have found the bell-tent, single or double, about the worst possible for any purpose, except perhaps pictorial effect. The double fly E.P. mountain battery tent, 8 feet by 12 feet, weight 80 lbs., would shelter four men in comparative comfort, at a weight of 20 lbs. per man, but they should also have one large recreation tent or hut supplied with chairs, stools and tables, papers, cards and a few simple games, such as draughts, dominoes, &c., and a small bar for mineral waters, tea, &c. They should also be encouraged to play outdoor games, such as rounders, football and quoits. These require little paraphernalia, and an evening game of rounders, in which the junior officers might join, would do much to break the monotony and promote cheerfulness and good feeling, without in any way impairing discipline. Camp fires and sing-songs in which officers, convalescent patients and orderlies join, should also be encouraged.

The nursing sisters should have such games as badminton, deck-quoits and bull, and everyone should be encouraged to do something when off duty, and not lie about thinking of their happy homes and present discomfort.

These suggestions are not intended just to give the staff a good time, but to promote the comfort and welfare of the sick, and are of more real importance than mere outside decoration of the hospital. When every matter relating to hygiene, the treatment and comfort of the sick, and the welfare of their attendants, has been perfected, "finish" is not to be despised, but it should come last, not first. Mere outside show may cover a multitude of sins, and, even if it does not, may place too great a strain on the working powers of the staff. In all things the hospital should be for the sick, and not for the honour and glory of the officer in charge.

At first the treatment of the sick largely devolves on the stationary hospitals on the lines of communication, which are hastily expanded to meet the needs of the moment; but once the advanced general hospitals are in working order, invalids for the coast should be passed straight through, and not from hospital to hospital, and those on the line should be reduced till they are only sufficient for local requirements, their surplus equipment being sent to the front and their civilian employees utilised to the best advantage elsewhere. Ambulance coaches, attached to ordinary trains, will collect the sick, from the smaller guards and posts along the line, into these hospitals. If there should be any

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unavoidable break in the journey, such as a transition from rail to river transport, a large hospital must be kept open at this point; and perhaps some, whose position is exceptionally favourable, may be expanded into general hospitals, but there should be no delay in reducing the remainder to actual requirements, and utilising their material elsewhere.

Ambulance trains should be assembled and fitted from rolling stock in use on the system over which they are to run, as, by this means, the weight of the trains can be best adapted to the engines which have to pull them, the condition of the line, and the gradients which will be encountered. This is more satisfactory than the use of large and heavy trains fitted elsewhere, without regard to local requirements. Minor details may vary, but there are some essential conditions which must be fulfilled. The train must be built on, or altered to, the corridor plan, as through communication while in motion is indispensable on long journeys. It must contain a kitchen, pack store, steward's store, and accommodation for medical officers, nursing sisters, and attendants. The number of the latter will, of course, depend on the number of patients which can be carried, and this will be limited by the weight which can be pulled. There must be sufficient facilities for washing, for officers, patients, and orderlies, as well as latrine accommodation, and if more than one day is to be spent on the train baths will be needed. One closet pan and one fixed basin will usually be found in the lavatory at each end of a saloon or corridor carriage. Any carpenter can make and fit rectangular wooden trough baths, and a plank fitting over the top of these will support two hand basins on each. These will be found far superior to canvas baths, which soon get very foul. A light blind of cotton drill, to lower over the bath and prevent splash, is easily fitted, and is well worth the trouble. It need not be waterproof. Water tanks should be fitted to all carriages, with hose connections, so that the whole system can be filled from one opening at either end of the train. A small dispensary should be fitted. It need not be much larger than an American roll top desk, but will be far more convenient than an outfit of "Field Companions." Part of the front should let down to form a dispensing table.

Saving of weight means increase of carrying power, and perhaps the possibility of adding an extra carriage to the train, and therefore, heavy iron fittings, such as are required for holding berths, are to be avoided, and light wood and canvas fixed berths used instead. The cooking range, especially, should be light. If made of good material there is no reason whatever why it should

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be ponderous. The choice of a light in place of a heavy wood for shelves and fittings will make a great difference in the aggregate.

It may be necessary to utilise the carrying power of the train to the full, but if about ninety patients can be carried and an additional spare coach added to serve as a dining and sitting room for convalescents, it will be a great relief on long journeys, especially in a hot climate.

In calculating weights it must not be forgotten that it is the loaded train which must be taken.

As to the order of arrangement, it is important that the kitchen should be next the staff quarters, and the convalescent enteric cases placed at the other end of the train. It may seem a small point, but it is cruel to carry savoury dishes past hungry men who may not touch them, or to tantalise them with the smell of cooking.

Too much room should not be occupied by the staff quarters. The medical officers are far better off in any case than their brethren at the front, and excess of space devoted to their comfort means so much less for someone else. The Royal Army Medical Corps rank and file will be the probable sufferers.

A large supply of disinfectants should be carried and all excreta sterilised, special receptacles being fitted under the closets, and the contents emptied and dealt with, at regular stopping places, by a special sanitary staff. The use of izal and dry-earth in the pans would render the contents inoffensive and fairly safe.

River passenger steamers require little alteration to fit them for ambulance purposes, and on most navigable rivers they can tow two large flats or barges, lashed side by side, at a fair pace down stream. These latter, fitted with awnings, wood and canvas bunks, and divided by canvas screens into kitchens, wards, convalescent deck, orderlies' quarters, and quarters for the nursing sisters and medical officer on duty, with pack store and steward's store on the lower deck, can be made to carry a number of sick in great comfort. It is well to have two nursing sisters and one medical officer always on duty on the flats, and one medical officer with one or two nursing sisters on the steamer.

River steamer captains always tie to the bank at night. In a malarial climate this should be strictly forbidden, as the banks, especially near high grass, usually swarm with mosquitoes, while the stream is comparatively free from them. Convalescent officers will clamour for an evening walk, and, unless the captain of the boat has strict orders from high authority on the subject, he will tie up to save the trouble of anchoring, in which case much

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avoidable fever will result. Every boat ambulance and every hospital train should, if the journey is more than twelve hours long, carry one washerman, and be provided with a small bunk for washing accidentally soiled clothing in.

When the advancing force leaves the line of rail or river, stationary hospitals must be established behind it at comparatively short intervals. Wherever a post is established to guard communications, it will usually be advisable to put a stationary hospital or a section thereof, and between these to form a convoy rest camp every ten or twelve miles, should the state of the country admit of it. These should be equipped with dooly or stretcher-beds, or locally purchased cots, as it is very hard for sick men to spend the night upon the ground after what, to them, is an exhausting journey. They should hold a good supply of medical comforts, and a small stock of medicines and surgical materials. Their sanitation and water supply should be most carefully arranged and supervised. They require a supply of fodder, and special arrangements for watering transport animals. Definite lines for the latter should be marked out, and a separate camp for their attendants established in a suitable situation a little apart from the hospital camp, and rules must be laid down for the thorough cleaning of the camps and lines immediately after the departure of each convoy. Each camp should have a staff of at least three men, one of whom should be able to cook. A St. John's or Volunteer Ambulance man might be placed in charge, with a civilian cook and orderly under him. They should have a good supply of effective lamps. Convoys often arrive just at, or after, dark, and want of light causes some confusion and difficulty in feeding the sick, dispensing, adjusting necessary dressings, and settling down for the night. The practice of placing a solitary man in charge of these lonely posts, as has often been done in former wars, is cruel, and leads to insanity and crime. They should be frequently inspected, and a firm check should be kept on the consumption of comforts, especially liquors. The orderly in charge should be made to keep a book like Army Book 188, and enter in it the quantities issued to each convoy. The convoy officer should sign both foil and counterfoil, and take the former with him to be handed in at the stationary hospital. Here the quantities would be entered in a "Convoy Camp Book" (fig. 5), kept in columns, under the name of the camp, and the foil filed. This would involve but little clerical labour, and would provide the stationary hospital and inspecting officers with a ready check on the comforts issued to, and used by, each camp.

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The inspecting officer should not only note that the camp is thoroughly well kept in every respect by the men in charge, but should encourage them to improve its appearance, by paths and gardens, and extra smartness, as all this occupies them and keeps them fit; but, however they make work, they will still have much spare time and many weary, monotonous hours to get through, and they should, as far as possible, be supplied with magazines, papers, cards, draughts, or dominoes, string for netting, wool for knitting, or a few hooks and some line if there is a river or lake near, or the care of a few milch cows, goats, or fowls—anything to keep them from lying about all day smoking and longing for a drink. The inspecting officer should make it a part of his duty to find out what these isolated men need, and do all in his power to supply it.

FIG. 5.—*Specimen Page of Convoy Camp Expense Book.*

CAMP—AMBIGOL.

Date	Ext. carnis oz.	Soup Tins	Milk Tins	Rice oz.	Arrowroot oz.	Cocoa oz.	Sugar oz.	Port wine oz.	Brandy oz.	Name of convoy officer
Totals brought up										
Total ..										

To be kept up at the Stationary Hospital from foils of Army Book 188 *brought in by Medical Officers in charge of Convoys.*

I once, in an emergency, voluntarily took charge of such a camp for three days, and although there was a good deal to be done in putting things straight, got some idea of what the life was like. There was not a scrap of printed matter in camp, or any human being, black or white, nearer than ten miles. My predecessor had been removed, a raving maniac, after five weeks of it. My successor was brought off a few weeks later suffering from delirium tremens—two men and a quantity of good liquor wasted through want of ordinary precaution and humanity.

In addition to stationary hospitals and rest camps, it will be necessary to push forward large hospitals, equal in size, and, as far

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as possible, in comfort and practical facilities for treatment of the sick, to general hospitals, but with less cumbersome equipment. These hospitals will be necessary, because acute cases and wounded cannot be sent the long convoy journey to the railway, and, therefore, accommodation for at least 10 per cent. of the force must be provided immediately in rear of it. In order to secure the two requisites of mobility and comfort, every ounce of unnecessary weight must be pruned away.

The modified Cabul service mess tents, pitched in pairs, as suggested, could be made to hold twenty-four cots with 18 inches space between each, at a weight of about 46 lbs. per cot, or, if the climate admitted of the outer fly being left, at about 34 lbs. A strong cot, 6 feet 3 inches by 2 feet 6 inches by 1 foot high, with head rail and legs folding flat, could be made with a frame of $1\frac{1}{4}$ inch 16-gauge bicycle steel tubing, and a bottom of steel spring wire or canvas, at a weight of 21 lbs., or possibly a little less. This, with a 12-lb. mattress, a 3-lb. coir and a $1\frac{1}{2}$-lb. feather pillow, two blankets and sheets, would give a total weight of tentage and bed and bedding per patient of 96 lbs. with the double, or 84 lbs. with the single fly. Pyjama suits would be required, which, with reserve for changing, would add about 4 lbs. per patient.

All possible utensils, cooking and others, should be made of aluminium, or aluminium alloy. It would be, like the cots, expensive, but a good mobile hospital of this size and class can never be cheap, and it would save its cost in transport just when transport was most valuable.

The cooking range must be left behind. It is impossible to drag around a couple of tons or so of metal for this purpose when the troops are possibly on short rations for want of transport. Our men should be taught to cook over the small Indian "chula," which can be constructed anywhere, and burns little fuel. The service camp kitchens are very wasteful in this respect. There is no need to copy the insanitary features of Indian cookery, but only the production of well-cooked, palatable dishes, with very simple apparatus, and the expenditure of little fuel; for the man who cannot prepare palatable food without an elaborate kitchen range may be a perfect Soyer at home or at the base, but is simply a useless inefficient at the front. We are teaching our men to cook better, but I fear that we are also teaching them that they cannot cook at all without an elaborate and cumbrous apparatus.

Good lighting is very necessary. It is not probable that electricity would be available for either this or for stationary hospitals

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off the line of rail. Acetylene lamps with a separate generator for each, so as to avoid a burdensome installation of tubing, would answer admirably, and the fuel is light and portable, while paraffin is obtainable in most countries, and no doubt the lamp makers could meet our requirements if clearly specified; witness the powerful "sun" lamps which throw the whole light downwards, and the motor lamps which give a steady light in the strongest winds.

Four ambulance waggons, two general service waggons, two light carts, and four water carts, with horses and drivers, should be permanently under the orders of the medical officer in charge. The hospital should also hold some wheeled stretcher carriages and a large reserve of doolies.

All sick and wounded able to travel, and likely to require prolonged treatment, should be passed to the rear whenever possible. Slighter cases should be treated and returned to duty, and severe cases, unfit for removal, must perforce remain.

As the force moves on, the advance line of communication hospitals will be thrown forward, and the light general hospital will be cleared of sick as fast as possible, ready for a further advance; in the meantime, a similar hospital must be pushed forward to take its place when required. The whole *personnel* of these light general hospitals should be Royal Army Medical Corps, with the exception, perhaps, of one consulting surgeon, as the officer in charge of it has no time to instruct civilians in their duties.

As the war proceeds, and the country behind, which has been swept by the advance of large armies, settles down, it will usually be convenient to divide it up into districts, and carry on its medical administration on the ordinary lines of a British possession.

War between civilised nations is usually decided by a succession of heavy battles between regular troops; but occasionally a brave people will rise and continue a guerilla warfare after the defeat of the regular armies, while, in savage war, the whole male population is under arms, and, in both cases, away from lines of rail or river, communication is only open to armed parties of sufficient strength, and, under these circumstances, the conditions under which medical aid can be rendered differ materially from those hitherto described. Usually a river or line of rail, or the main trade centres, have been seized and are held in force, and at these "General" or "Stationary" hospitals are established, according to requirements. From these primary posts, armed columns are despatched in various directions through the surrounding hostile country to seize subsidiary points of vantage, follow up and crush organised bodies of the

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enemy, and pave the way for civil rule with the aid of an armed police. The guerilla, unable to meet regular troops in the open, betakes himself to mountain, wooded or marshy fastnesses, where wheeled transport, as a rule, is useless, and under these difficult conditions all sick, wounded or dying must be carried forward with the column, and there can be no such thing as a man "too ill to be moved." Those able to sit up must be carried on ponies, mule or camel cacolets, or elephants, and the remainder in doolies. The country is usually far too steep and broken, or the forests too dense, for animal-borne litters of any kind, and the whole transport of such a column must be prepared for the worst ground it may have to meet; no half-way change is possible. The stretcher is useless, for the sick must be carried for anything between ten or eighteen miles a day at the pace of the marching troops, whose efficiency must not be impaired by delay on account of their ineffectives, and to fall out means death (probably by torture) for sick and bearers alike. Indeed, the light dooly is as far in advance of the stretcher as a method for transport of wounded, as the Lee-Metford is of the flintlock as a weapon of offence, and doolies, in the proportion of 10 per cent. of the strength, should accompany such a column.

If tents can be carried at all, the I.P. Mountain Battery tent is the best, with a single fly tent like the Elgin Mills "Light Bath Tent," but 8 feet square, for operating.

The medical and surgical equipment will be arranged according to the strength of the column and the probable duration of the expedition. The medical officer in charge should have power of purchasing supplies, such as fowls, eggs, milk, meal, rice, &c., for use of the sick. However otherwise employed throughout the day, he should arrive at the spot chosen for the halt with the advance guard, and at once take measures for the protection of the water supply, and assist in arranging the bivouac to the best sanitary advantage, as far as military exigencies permit. When his sick arrive, he will see them placed in such temporary shelter as may be available, and their immediate wants attended to pending the erection of the tents, the preparation of existing buildings, or the erection of brushwood or thatched shelters. In most cases, comfortable beds of brushwood covered with straw or dry grass or leaves can be arranged for the lighter cases. It is wonderful what can be done in this direction in the most inhospitable places, if the medical officer attends to it himself. It is usually better to make up such beds as described rather than use

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native cots, as these are apt to swarm with vermin. As soon as the sick are installed in their tents or shelters they must be fed, after which the medical officer had better get his own food before doing the necessary dressings, seeing fresh sick and performing operations.

Each medical officer in charge of such a column should be supplied with four good lamps, which will not blow out under any conditions. This is of vital importance, as serious operations may have to be performed after dark.

Advantage must be taken of every escort proceeding to an established post to get rid of all sick and wounded who are able to travel, with the exception of such cases as will be fit for duty within a few days.

At all the large garrisons, stationary hospitals should be held in readiness, and sections of them despatched to each military post established by the flying columns as soon as escort is available. The medical officers in charge of troops will then be able to discharge their sick into these at intervals, and they will transfer to the larger hospitals as communications become more open.

I have purposely omitted to go into the details of the fitting and arrangements of sick transports and hospital ships, as I have had little personal experience with them, and opinions formed from mere reading could have no practical value.

In conclusion, I wish to mention a precaution against malarial fever which, during four years civil work in Upper Burmah, I, personally, found of the greatest value. I allude to the inunction of the exposed parts of the body with aromatic oils, which prevent, or at least discourage, the attacks of mosquitoes. My work took me at all seasons of the year into jungles which were simply poisonous with malaria, and all the leave I could obtain was spent in pursuit of big game, which invariably frequents the most malarious localities, and, although by no means immune naturally, the only attack I got was once when, having forgotten my oil, I was out for two nights. On one occasion, out of a party of eleven, although all had mosquito curtains, two who used the oil alone escaped fever, and I could multiply instances of its value *ad infinitum*.

Now, while other diseases may cause a larger mortality, none so fatally reduces the fighting efficiency of a force as malarial fever. The Durham Light Infantry were so weakened by this disease that they were unable even to furnish their own baggage guards to the railway station when they left Mandalay in 1901.

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We have proved that the cause of the fever is the bite of the Anopheles, and, so far as troops in the field are concerned, we stop dead short and leave it at that. Now there are three ways in which we can attempt to prevent it:—

(1) Extermination of the insect, which is impracticable on service.

(2) Mechanical protection of each individual by means of mosquito netting, &c., probably impracticable on service, although the Egyptian Army furnishes their black troops with this protection. It is, at any rate, very imperfect, for the mosquito by no means confines her operations to night time. In Burmese forests, at any rate, she is very much in evidence all day, and by 5 p.m. is well on the wing, and extremely hungry. Neither the soldier nor sportsman can avoid her by the simple use of nets at night.

(3) Protection by means of some aromatic, astringent or bitter substance, applied directly to the skin where uncovered by clothing. This is effective at all times, and is practicable in the field. Its application may be difficult, but there is no other way. The principal objections to it are:—(*a*) That we have not yet discovered an absolutely protective application. This is only a reason for turning our serious attention to a really important subject; (*b*) that the men could not be got to use it if provided. This is a matter of discipline, and could and would be enforced, once its value was placed beyond dispute, and here we have the whole-souled assistance of the mosquito herself, who is such an unmitigated nuisance that the most casual are glad to get rid of her; (*c*) expense and difficulty of transport of a large quantity of the substance used. I can only say that anything that would keep men fit to fight is worth its weight in ammunition, for men are, after all, the most expensive items in the field. The subject is too serious to be set aside by frivolous objections, and the loss to a fighting force is not represented merely by its men in hospital, for every infected man is liable to go down with fever just when most needed. A night march, the fording of a river, the chill of the dawn when fallen in for the attack on some position, and they go down in dozens.

Many other diseases besides malaria have been traced to the bites of various insects, and the subject of protection is becoming a pressing one, if any practical good to the health of our troops on service is to result from the scientific research which has been so ably carried on of late years by officers of the Army, Navy, and Indian Medical Services.

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