

sterilizes the water with chloride of lime, however pure the source of the supply may be. Further, a special naval medical officer is employed in

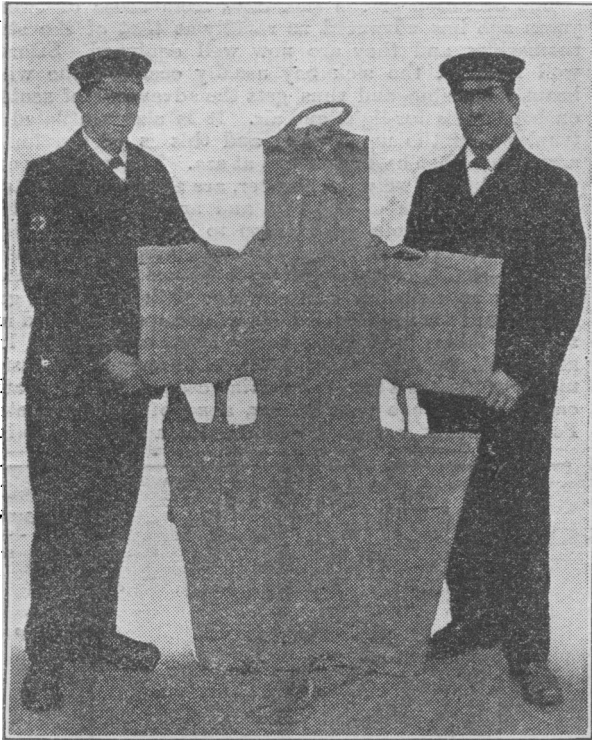


FIG. 1.—Neil Robertson Stretcher Open.

the sole duty of seeing that every precaution possible is taken to safeguard the water from pollution during its transit from shore standpipes to ship's tanks. He travels from port to port inspecting the water-carrying vessels to see that their fittings are in accordance with hygienic requirements and that the method of transferring the water is in accordance with the rules laid down by the Medical Department.

During the Gallipoli campaign a distilling apparatus of great capacity was set up in Mudros in order to provide the ships and the Naval Division with an ample supply of pure water.

As the sites of air stations have been selected primarily from a fighting point of view, the water supply, both as regards quantity and quality, has often proved a matter of difficulty and anxious consideration; it has then been necessary to arrange for sterilization by chlorination.

Unhealthy Occupations.

The composition used for the preservation of the fabric of aeroplanes contains material which, in civilian factories, has given rise to many cases of toxic jaundice, some of which have proved fatal. Although the Naval Air Service has used a very large amount of this "dope" no deaths, nor, indeed, any cases of illness entailing loss of service for a single day, have occurred. This fortunate result is to be attributed to widely disseminated information among the personnel as to the danger to be guarded against, efficient artificial exhaust arrangements (giving thirty changes of air per hour in doping rooms) and complete organization for extensive alternation of work.

The "dope" used in varnishing air-ship envelopes is of an entirely different nature, and in the absence of protective measures causes symptoms resembling acute alcoholism; but here again, although several hundreds of men are employed continuously at this work no ill effects can be traced to it owing to the efficient methods of immediately removing the fumes by a large number of powerful exhaust fans.

In our munition factories 5,000 men and women handle tri-nitro-toluene (T.N.T.), but no dust is allowed to collect, and the regulations for the protection of workers have been so strictly carried out that not only have there been no fatal cases, but there is no record of a single case of toxic jaundice. Although many authorities believe that the poisonous agent in T.N.T. is introduced through the skin, it is considered unjustifiable to allow the fumes of melting T.N.T. to escape into the general atmosphere of the room, and in all our factories artificial exhaust arrangements have been fitted to remove the fumes from their point of origin.

THE SERVICE AFLOAT.

BY

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AND

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ALL senior medical officers afloat of the Royal Navy appreciate the work of preparation which has been steadily going on for many years, most markedly in the last decade, in the Service. The plans laid down in peace time for the rapid expansion, when war should be declared, in personnel and stores, all bore fruit when put to the test in 1914, and this expansion still continues.

The installation about six years ago of high-pressure steam disinfectors in ships has, since the outbreak of war, proved of supreme value. Besides providing a weapon to combat the exanthemata and other infectious diseases as well as scabies, they sterilize clothing and dressings as frequently as may be desired. Another great improvement of pre-war times was the replacement of the clumsy service stretcher by the two forms of stretcher now in general use—(1) the bamboo stretcher designed from the Japanese stretcher by the late Fleet Surgeon Neil Robertson, R.N. (Figs. 1 and 2), which renders possible the removal of wounded from small compartments, down escapes in turrets, and round difficult corners with a minimum of danger and discomfort, and (2) the ambulance field service stretcher (Fig. 3), which enters so largely into the scheme for increased stowage space by the tier system, as explained further on (Figs. 4, 5, and 6).

At the outbreak of war the supply of stores and instruments increased automatically, and catgut, silk, and the like were sent to ships in portable tubes ready sterilized. The ships have always been on a war footing, but much has been learnt since the start of hostilities, notably the



FIG. 2.—Neil Robertson Stretcher with Patient.

large number and severity of burns encountered in action. Pictures of bluejackets working their guns stripped to the waist are picturesque reminiscences of the past, but the battle of Jutland showed that exposed parts, such as face,

neck, hands, and arms, are very liable to be severely burnt.

For the evolution of the anti-gas apparatus thanks are due to Fleet Surgeon D. W. Hewitt, R.N., and Mr. A. Hutchinson, of Pembroke College, Cambridge. Their work goes to prove that the naval medical authorities are keeping pace with and countering the fresh devices of the enemy in this respect.

Burns.

The paraffin, or "ambrine," treatment of burns introduced by Médecin-major Barthe de Sandfort of Paris (late of the French navy) has been adopted by the Naval Medical Service afloat. A small slab of the wax, which is

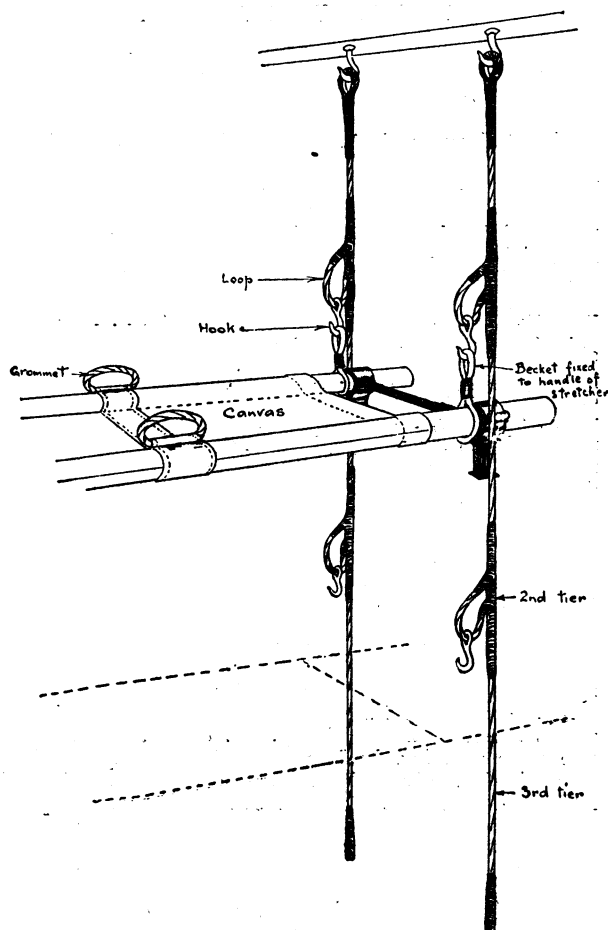


FIG. 3.—Bamboo "field" stretcher slung from wire roping in tier of three systems. Design adopted by the Admiralty.

a mixture of paraffin and resins, is put into a metal spray producer and heated, either over a spirit lamp or in a water bath, up to the temperature when the wax melts. The bellows of the spray producer are then adjusted, and the liquid wax is pumped as a very fine spray on to the burnt surface, which has been previously dried thoroughly. A cake of wax forms over the surface, and is both air-proof and, from the heat at which it is applied, aseptic. A thin layer of cotton-wool is then laid on this wax, and the whole is again covered with the liquid wax applied by a brush. The results are very satisfactory; pain is certainly relieved rapidly, and subsequent dressings are almost painless.

Caisson Disease.

Another valuable adjunct to the medical service is the compression chamber fitted in one of the base ships for cases showing signs of caisson disease. It has proved very useful in the few cases in which it has been necessary to use it.

Dentistry.

The appointment of dental surgeons to certain ships in the Grand Fleet has been very valuable. Their services became necessary owing to the few opportunities which men had to visit the dental surgeons at the bases. The

amount of work they have accomplished has proved of infinite benefit to the comfort and well-being of all hands.

Sick Bay.

The evolution of the sick bays from those of twenty years ago has advanced as rapidly as that of the ships themselves, and they are now well equipped. Situated well forward, the sick bay usually occupies the whole beam of the ship, and thus gets the advantage of scuttles on both sides for light and air. It is also ventilated by trunks from the upper deck, and this is of inestimable advantage when battened down at sea. The swinging cots, from eight to twelve in number, are slung on supports in the main portion of the bay, and arranged in two tiers with room between each group to nurse on both sides. There is also room for a few hammocks. The messing room is usually curtained off from the beds. The operating room is an excellent compartment with tiled floor, good light from both scuttles and electric groups, enamelled iron shelves, tables, and wash bowls, electric wandering lead and serviceable operating table. The supply of instruments comprises a major operating case, a minor operating case, a case of eye instruments, a set of silver catheters, Potain's aspirator, a small dental outfit, a sterilizer, splints,

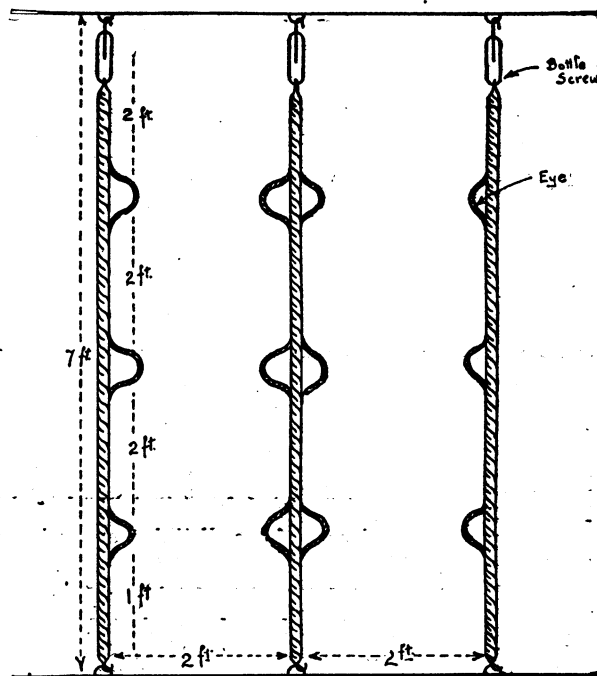


FIG. 4.—Wire-rope uprights in position for reception of cots or stretchers. Designed by Staff Surgeon Bringan, R.N., in H.M.S. Edgar.

irrigators, etc. The dispensary is well lighted and fitted up. In some of the newer ships a separate mess is provided for the sick berth staff. This is a great advance and much needed accommodation. There is also an isolation cabin, usually with two beds, which can be used as a junior-officers' hospital.

In order to obtain all the advantages as regards space, light, and air, the sick bay must be situated in an unprotected part of the ship. This subject is closely connected with that of the accommodation for the sick and wounded and the medical staff during an action, and also after it, as the sick bay itself is likely to be shattered.

Distributing (Dressing) Stations.

In all modern ships there are two distributing stations designed in the construction of the ship, where the medical officers and their assistants are stationed in action; these are usually situated one in the fore part and one in the after part of the ship. They are designed so that they shall be, as far as possible, in the most protected parts of the ship, and for this reason there are many difficulties as regards space, ventilation, and temperature, these dressing stations being usually in close vicinity to boiler rooms or other engine-room compartments, which are necessarily in the most heavily armoured parts of the ship, and are

usually hot and the space limited. They are nowadays fitted permanently as dressing stations, with operating tables, shelves, cupboards, and other appliances, and are kept always ready in war time, so that when the ship prepares for "immediate action" only those stores, instruments, dressings, and so forth which are in daily use in the sick bay proper are removed to these stations.

Stowage of Wounded.

The stowage of wounded in the limited space available under armour has exercised the minds of naval medical officers for many years, and active service quickly demonstrated that the decks became too wet to be desirable or comfortable for the wounded; further, very few cots and stretchers could be accommodated in the space at our disposal. Much ingenuity has been displayed by various officers to increase this cot accommodation—Fleet Surgeon Lavertine, Staff Surgeon Bringan, and the late Fleet Surgeon Capps. In all their designs the tier system has been adopted. The two chief types produced are (a) the rigid wooden skeleton to hold cots or stretchers, and (b) wire roping, fitted with loops at intervals of 2 ft. to carry the stretcher, fixed to the beam above, and either fixed to the deck below or allowed to swing clear.

The committee appointed to report on accommodation of wounded decided on the wire-roping system, erected in single tiers for three stretchers, as the most useful. Figures 3, 4, 5, 6 show the different designs. This contrivance, rigged near the distributing station on both sides of the main deck, and in other suitable sites, increases the stowage room threefold—keeps the wounded

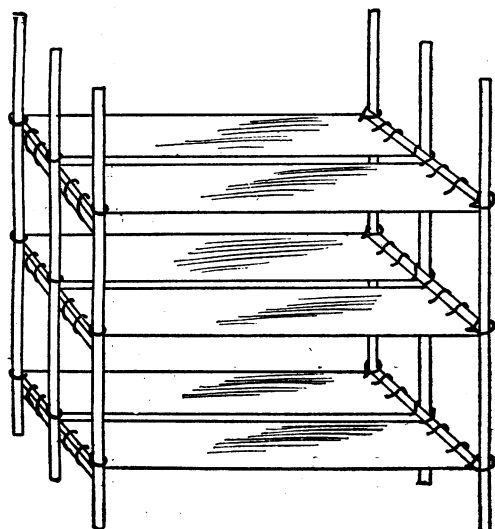


FIG. 5.—Representing a group of six cots in position. Designed by Staff Surgeon Bringan in H.M.S. *Edgar*.

off the wet deck, and places them in situations from which they can be easily attended to and moved should the disengaged side become the engaged one.

First Aid.

Besides the "first-aid" haversacks, boxes or cupboards for each gun are filled with single packages of dressings and other appliances, according to each medical officer's plan. Similar haversacks are usually supplied for the leading hands in charge of each stretcher party, and for every isolated position in the ship—that is, for each station in action where a number of men are isolated in various compartments such as conning tower, torpedo flats, gunnery and torpedo control positions, workshops, repair parties, engine rooms. The "first-aid" dressings supplied to these stations vary in amount according to the number of men stationed there, which may be from three to fifty men. It is also usual to have large tin boxes of additional dressings, tourniquets, scissors, splints, and other appliances in various accessible parts of the ship during action. These stores are used when there is any lull in the fighting, to replenish the haversacks or small boxes belonging to the guns and other stations without the necessity of coming to the medical officers in their usually distant stations.

It must be borne in mind that owing to the condition of a ship during and after an action, and to the excessive shock, even in the less severe cases of injury, it is advisable to avoid immediate operations.

Shock.

In order to combat shock the hypodermic injection of morphine is one of the most important duties of the medical officers during action, as this cannot be satisfactorily carried out by the best of lay assistants who have not previously been accustomed to it. No other forms of administration are entirely satisfactory, although commanding officers of destroyers in the early days of the war, when they were frequently in action, and before the appointment of surgeon probationers, had great faith in the small opium tablets with which they were supplied.

Sepsis.

The next most important duty in action is to combat sepsis, and although there is no soil contamination to be fought against, the wounds caused by shell are contaminated by all sorts of debris, resulting from shell explosion in a confined space, and the difficulties in the way of

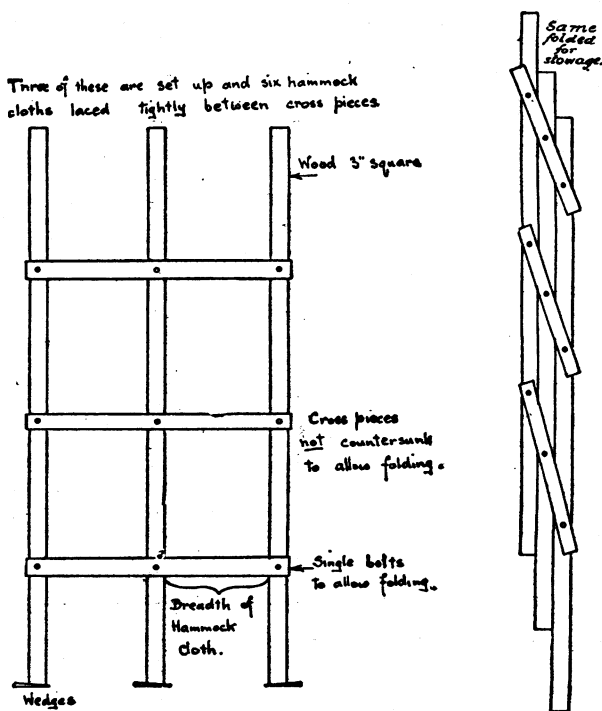


FIG. 6.—Upright as used in *Monarch* since August, 1914. Designed by Fleet Surgeon Lavertine.

cleaning the wounds are greatly increased if the hot water supply in the dressing stations has been cut off either by explosion there, or by destruction of the fresh water supply pipes in other parts of the ship. Recourse must then be had to the previously prepared stock of lotions and to iodine and rectified spirit. After combating shock and cleansing wounds, first dressings are applied and the patients made as comfortable as possible. After the action is over, or if there is a lull, it may be possible to do more in the way of surgery, but as the action may be resumed at any moment until the ship is outside the "danger zone," there will not be any time during which the ship is not liable to attack from the enemy, either by gunfire, torpedo, mines, or from the air, so that usually all that can be done is to remove the wounded to places previously arranged for, in all possible "protected" places, where their wounds can be redressed more carefully and splints applied to fractured limbs, and any immediate surgical work carried out.

Evacuation from Ship.

The evacuation of the wounded from a ship is a most important point, both from the wounded man's point of view and also for the efficiency of the ship. The ideal conditions obtain when a hospital ship can go alongside

the ship of war; then the wounded can be carried in their service cots and stretchers across a gangway to their beds. This, however, is rarely possible, and the services of the hospital carrier are called in as a go-between. In this case the wounded man is taken in his cot or stretcher and placed in the tray or cot carrier and hoisted out by means of a derrick into a hospital boat or barge, which transports him to a hospital ship, an ambulance train, or a local hospital, as circumstances command. The chief point to be remembered is that the less a wounded or burnt man is moved the better his chances of recovery.

Since the outbreak of hostilities the hospital ships have borne the brunt of the medical work in the fleet. The extreme undesirability of making preparation for action with several bed cases, whether medical or surgical, on board the fighting ship is evident. Cases of sickness or injury, if likely to be under treatment more than a few days, are therefore transported to the local naval hospital or hospital ship.

HOSPITAL SHIPS.

BY

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BEFORE the war there was only one British hospital ship in commission, the *Maine*, which was originally fitted out by a group of American ladies during the South African war and subsequently taken over by the Admiralty. Unfortunately this vessel went ashore in a thick fog on June 19th, 1914, and was lost, but the arrangements for the provision of sufficient hospital ships for the fleet previously made by the Admiralty worked admirably. Within four days of the order to mobilize for war three ocean liners were converted into hospital "carriers," and with their medical and nursing staff, and full equipment of cots, bedding, and medical and surgical stores complete, which had been kept ready in a lay-apart store at one of the large medical dépôts, were at sea, where any necessary alterations were completed by the artisan ratings, so that they joined up with the fleet ready for any emergency.

In the meantime work was being pressed forward in six other ships intended for more permanent service from plans which had already been prepared during peace, so that they were ready for sea in about three weeks or less. These vessels were mostly intermediate liners, in which the passenger accommodation and cargo space were easily adapted to their new purpose. The swinging cots fitted averaged about 220, but additional emergency accommodation was provided for about 300 more patients. In the Mediterranean this number was

sometimes largely exceeded, over 900 cases being conveyed to a base hospital on one occasion.

As a rule there are six or seven wards for men (Fig. 7)



FIG. 7.—Ward.

and two or three for officers, which were adapted by converting portions of the saloons or removing cabin bulkheads, some officers being also nursed in cabins. A padded room for mental cases was also prepared. The decks are covered with green corticine, which is easily kept in a high state of polish; the bulkheads and cots are enamelled a very light green. Ventilation is maintained by means of scuttles, supply and exhaust cowls, and special motor-driven supply ventilators. The wards occasionally became rather hot at night when dead-lights had to be closed; but this was corrected by Fleet Surgeon M. H. Knapp's plan of fitting the cylindrical portions of ordinary wind scoops with partial diaphragms which occupy about two-thirds of the circumference, so that while air is freely admitted no light shows through. Other alterations included the fitting up according to the existing plans of dispensaries, pantries, latrines, mortuary, disinfectant for clothes and bedding, cot lifts both inside and outside the ship, x-ray room, laboratory, laundry, operating rooms, and many other necessary adjuncts of a self-contained hospital. These necessary fittings had also all been stored in readiness before mobilization.

The operating theatres are installed either in music rooms or saloons, or in specially constructed erections on the upper deck (Fig. 8). In the former case the somewhat ornate walls are covered in with match-boarding enamelled white. The rooms are divided into two parts with separate entrances and sliding doors between—one half being used as a preparation and sterilizing room. The decks are tiled and all the tables, shelves, and other structural arrangements are of the aseptic pattern. In spite of their extemporized character, it does not appear that any case of sepsis could be definitely attributed to faulty surroundings.

The cot-lifts which serve the wards are placed near the operating rooms so that the exposure of a patient after anaesthesia is reduced to a minimum. The original supply of instruments and medical and surgical stores met the initial requirements; but subsequently, as it became necessary, further equipment was provided by the Admiralty.

General Duties.

On the Home Station the work of the hospital ships is to a large extent similar to that carried out by the *Maine* in peace time.

The Fleets at their different bases—often in remote districts where no shore accommodation is available—are attended by one or more ships. When nearly full they are either cleared by smaller hospital ships which convey the patients to a convenient rail-head for further transference by ambulance train, or at stated

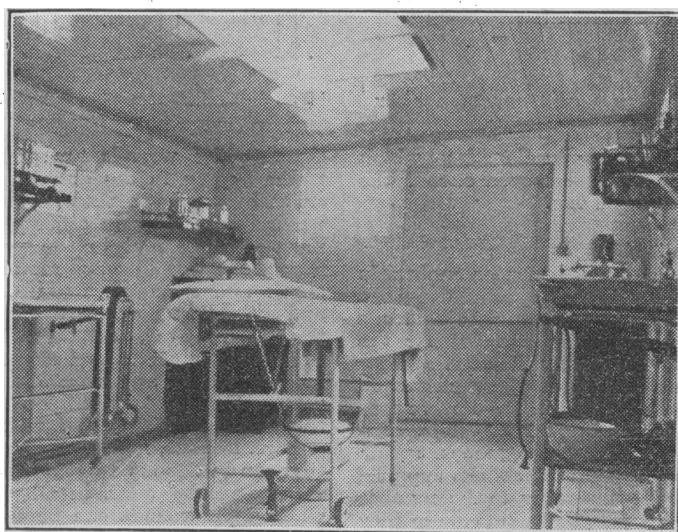


FIG. 8.—Operating room