Original Communications.

A REPORT UPON HOSPITAL ARRANGEMENTS ON BOARD TRANSPORTS.

By Captain G. B. Stanistreet
Royal Army Medical Corps.

Considerable difference of opinion appears to exist amongst various authorities, both naval and military, as to what hospital arrangements are essential to meet the requirements of sick and wounded soldiers on board transports, and the want of some guide as to what is required is much felt, for the very meagre description given in the Admiralty Transport Regulations of the specifications for fitting hospitals on board transports can hardly be regarded as a guide to modern requirements. Having had, as Embarkation Medical Officer at Southampton, unusual opportunities of familiarising myself with the difficulties and essentials of this question, I submit the results of my observations, in the hope that they may prove of some use to those called upon either to fit or inspect hospitals on board transports.

Accompanying this Report are plans of some of the best arranged hospitals, also some photographs which will, I hope, be of service in elucidating the descriptions given of the various hospital arrangements.

In this Report I do not intend dealing with the “fittings” of the special hospital ships employed in time of war, but only with the hospital arrangements on board the transports employed for the conveyance of troops between England and her foreign possessions, and for the homeward passage of invalids sent from abroad. I propose discussing the subject under the following heads, and do not intend taking up the question of the medical and surgical equipment of these hospitals, as its supply appears to be already sufficient and satisfactory:

1. The class of hospital accommodation to be provided, i.e., whether in cabins or in an open hospital on a cot-deck.
2. Facilities for embarking and disembarking helpless patients.
3. The position of the cot-deck hospital.
4. The cots and their arrangement.
5. Cupboards for patients’ medicines and medical comforts.
Hospitals on Board Transports

(6) Ice-chests.
(7) Mess-table accommodation.
(8) Messing accommodation for the detachment of the Royal Army Medical Corps.
(9) Pantries.
(10) Electric kettles and saucepans.
(11) Supply of drinking water.
(12) Appliances for heating and lighting the hospital.
(13) Lavatories, bath-rooms and w.c.'s.
(14) Wash-places for use of the medical staff of the ship.
(15) Means for disinfecting and washing hospital clothing.
(16) Dispensary and office.
(17) Hospital store-rooms.
(18) Ventilation.
(19) Means for isolating cases of infectious disease.
(20) Accommodation for sick women and children.
(21) Accommodation for sick officers.
(22) Accommodation for lunatics.
(23) Miscellaneous points.
(24) Hospital accommodation in troop freight ships.

The first and one of the most important questions for decision is:

I. The Class of Hospital Accommodation to be Provided, i.e., whether in cabins, or in an open hospital on a cot-deck.

The regulations for H.M.'s Transport Service are rather at variance on this point, for in the "specifications for fitting" hospitals on transports it is laid down that "a sufficient space will be appropriated in the most suitable part of the vessel for the hospital, and screened off with canvas screens;" while in Appendix I. it directs that "when it is possible to utilise cabins on upper or main decks as hospital berths, it should be done."

Now I do not think cabin accommodation for the treatment of serious medical or surgical cases can be too strongly condemned, and my reasons for this opinion are as follows:

(1) The extreme difficulty as well as the great discomfort and even danger to helpless patients involved in conveying them from their cabin berths to the main alleyways before they can be placed
on stretchers for disembarkation. A similar difficulty is experienced in embarking helpless patients.

(2) Under the circumstances just stated it is impracticable to have cot cases taken on deck for change and fresh air.

(3) A patient in a cabin berth can only be approached from one side, or at the most from one side and one end, for purposes of examination and treatment, which are in many instances carried out with great difficulty.

(4) In cabins, berths are usually arranged in two tiers, an obviously objectionable arrangement, especially in cases of bowel diseases or sea-sickness.

(5) The great difficulty experienced by a very weak patient in getting into and out of an upper berth for purposes of nature, &c., especially when there is a heavy sea running.

(6) The difficulty of securing efficient ventilation in cabins.

(7) The increased number of orderlies required to look after and attend to patients accommodated in separate cabins.

These considerations are more than sufficient to entirely condemn cabin accommodation for the sick and wounded. I should like, however, to add some further remarks with reference to the difficulties involved in disembarking helpless patients from cabins. It is a matter of great importance that it should be possible to place the stretcher, on which the patient is to be carried, either alongside his bed or at the head or foot of his bed, and this is impossible owing to the small size of the ordinary cabin; further, owing to the narrowness of the cabin door, and of the side passage between the cabins, it is impossible to carry a patient on a stretcher from his cabin to the main alleyway, running fore and aft, which is the nearest point to which the stretcher can be brought, and in many instances it is only with the greatest difficulty, as well as extreme discomfort and even danger to a helpless patient, that he can be carried thus far on a mattress or blanket. One has only to see a patient in an advanced and critical stage of enteric fever, or one with a fractured femur, taken out of an outside cabin to fully realise the difficulties and dangers involved in conveying him to a stretcher in the main alleyway. Cabin accommodation for the sick and wounded has already been abolished in the majority of transports, and the ships in which such hospital accommodation is still provided should not be used for trooping purposes until it has been abolished, and an open hospital on a cot-deck substituted.

Closely connected with this question is that of—
II. The Facilities for Embarking and Disembarking Helpless Patients.

Sufficient importance does not appear to be always attached to the facilities afforded for the embarkation and disembarkation of helpless patients. The difficulties involved in consequence of the accommodation of sick and wounded in cabins have already been pointed out, but there are other difficulties connected with the conveyance of stretcher cases from one deck to another, and between the ship and the shore.

The provision of a lift is the most suitable means for the conveyance of helpless patients from the hospital deck to the deck from which they are disembarked, and vice versa. It seems hardly necessary to point out that the lift should be sufficiently large to admit of the regulation pattern field ambulance stretcher, used for the disembarkation of invalids, being placed on it without difficulty, yet most of the lifts which I have seen on hospital ships and transports are too short to take this stretcher without a great deal of manipulation, involving delay and difficulty in placing the stretcher on the lift, and in taking it off after the lift has been hoisted up as high as it will go, for it cannot be hoisted up to the full extent in consequence of the poles of the stretcher projecting beyond the lift. All these difficulties and manipulations occasion a great deal of discomfort to the patient, and fill him with dread of an accident.

The lift should be provided with wooden side-pieces running along its entire length on each side to prevent the possibility of a patient falling over the edge of the lift while being raised or lowered. These side-pieces can be conveniently attached by means of patent hinges, and when raised should stand at least 12 or 14 in. above the surface of the lift. I have seen several lifts unprovided with these side-pieces, and there is considerable danger of a serious accident occurring in consequence. The guide-posts should be faced with metal on the surfaces on which the lift travels, and the ends of the lift which come in contact with the guide-posts should be provided with small rollers to prevent jamming while the lift is being raised or lowered. The wooden cross-bars in the floor of the lift should not be placed so far apart as to entirely admit the rollers of the stretcher between them, as in that case the patient comes to rest on the lift instead of being kept off it by the stretcher, but they should be placed at such a distance
as to partially admit the rollers, and thus prevent the stretcher moving forwards or backwards while the lift is being raised or lowered. Care should also be taken to see that the lift can be easily approached by a loaded stretcher on each deck, and that there is nothing to interfere with the stretcher being placed on or taken off the lift, e.g., two very stout wooden uprights with a movable cross-bar have been erected on the upper deck of the transport "Plassy" to prevent men falling through the hatchway in which the lift is located. These uprights are placed only 5 ft. 6 in. apart, so that great difficulty is experienced in placing a stretcher (7 ft. 9 in. in length) on the lift or taking it off, and as a matter of fact the structure is entirely unnecessary, as the object for which it has been erected could be as easily attained by stretching a couple of chains between the iron stanchions opposite the lift, similar to those by which the rest of this hatchway is surrounded. Again, the upright guide-posts of the lift on the transport "Assaye" are not placed opposite the iron stanchions between which loaded stretchers have to be placed on or taken off the lift, and this operation is consequently rendered more difficult.

In ships in which lifts are not fitted for raising or lowering patients from one deck to another, a wide gangway with an easy gradient should be provided for the purpose in a suitable position easy of access to the hospital, and care should be taken that the gangway can be easily approached by a loaded stretcher both at its upper and lower end, and that there is no structure to interfere with the patient being kept as nearly as possible in a horizontal position while being carried up or down the gangway on a stretcher. In some transports the stretchers have to be carried up the saloon companion in order to avoid steep and narrow gangways and sharp turns in narrow passages; in others, even in the better class transports, great difficulty is experienced in passing loaded stretchers through some of the water-tight doors, which are only 24 in. wide. It is a matter for regret that these doors were not made wider when the ships were being built, as in other ships I have found water-tight doors 36 and even 42 in. wide.

Many different forms of apparatus have been invented for the conveyance of lying-down cases between the ship and the shore, but I have had no practical experience of any of them, and it would be outside the scope of this Report to discuss their relative merits. even were I in a position to do so. I shall merely
remark in passing that the method employed at Southampton is that of carrying the sick and wounded lying on ambulance stretchers or sitting in carrying chairs along a gangway, and it is found to answer satisfactorily on the whole. Extra long gangways, and occasionally other means, are required at high water to diminish the steepness of the descent to the wharf, and these long gangways are especially necessary in the case of ships unprovided with a port opening off the main deck through which invalids can be disembarked. The gangways should be extra wide so as to facilitate the passage of the bearers with their stretcher.

Some of the difficulties referred to in connection with the disembarkation of helpless patients might be avoided by providing a number of stout canvas sheets, sufficient to allow of one being appropriated to the use of each patient to be carried ashore. Each sheet should be 6 ft. 6 in. long by 2 ft. wide, and should be provided with a canvas sheath along each side, through which a pole can be introduced for the purpose of converting the sheet into a stretcher; iron cross-bars with a ring at each end, which can be slipped over the handles of the stretcher, should be provided with a view to keeping the stretcher poles apart—these cross-bars can, if necessary, be dispensed with in passing through narrow doorways. The canvas sheet can be placed under the patient as he lies in his bed on the cot-deck in the manner usually adopted by hospital nurses in changing the under-sheet, the poles can then be introduced into their sheaths, and the cross-bars adjusted or not according to the requirements of the case. A mattress having been placed on the lift, the patient can be laid on it with the canvas sheet still beneath him, and the poles withdrawn. These can be re-introduced as soon as the patient is hoisted on the lift to the upper deck, and he can be carried ashore in the manner described and into the ambulance train, where he can be laid on a mattress on one of the cots, the poles being again withdrawn. On the arrival of the train at the Royal Victoria Hospital, Netley, he can be similarly carried out of the train and placed on a bed in the ward to which he has been allotted, and the canvas sheet can then be withdrawn from beneath him. By adopting this plan the patient can be transferred from his cot on board ship to his bed in hospital with the greatest amount of comfort, and the least possible amount of disturbance in consequence of having to be shifted several times between cots and stretchers.
III. The Position of the Cot-deck Hospital.

The necessity for the abolition of cabin hospital accommodation, and the provision of an open hospital on a cot-deck having been established, the position of the hospital is the next question to be considered.

The Admiralty Transport Regulations lay down that "a sufficient space will be appropriated in the most suitable part of the vessel for the hospital," and that it "must be built in the lightest and most airy place." Notwithstanding these instructions I have found the hospital in some cases situated over the screw, and in others right up in the bow of the ship, while in a vessel I inspected not long ago, the hospital communicated with the lower troop deck by means of a large open hatchway, through which much foul air and noise reached the hospital (this defect has since been remedied). The hospital should be placed on the upper or main deck, and as nearly amidships as possible with a view to diminishing the discomfort arising to the patients from the motion of the ship and the vibration of the screw; it should also be placed as remote as possible from hatchways through which cargo and heavy baggage are lowered into and taken out of the hold. I have seen such a hatchway running through the hospital deck. In some transports the hospital is placed on one side of a portion of the main deck, while in others it extends across the entire width of that deck; the latter is much the best arrangement, as it increases the facilities for ventilating and lighting the hospital, and makes it more compact. In the P. and O. transports "Plassy" and "Assaye," a portion of the hospital (ten cots) is located on the after part of the upper deck above the main hospital, which is a convenient arrangement for the accommodation of special cases. It is also found very convenient to partition off three or four single-tier cots on the main hospital deck to form a separate ward for special cases. This ward should be provided with a wide doorway through which a loaded stretcher can be easily carried into or out of the ward, and should be fitted with a washstand (with water laid on), and also with a portable electric fan. It seems hardly necessary to point out that the hospital deck should be solid, the wooden deck being properly laid on the iron deck, the two being bolted together so as to leave no intervening space.
Hospitals on Board Transports

IV. The Cots and their Arrangement.

In the regulations for H.M.'s Transport Service, the following instructions are laid down: "Standing bed-places, three to every 100 men fitted for, to be built up in one or two tiers as directed, well clear of the deck and side, 6 ft. long, and 2 ft. 3 in. wide in the clear, with iron lattice bottoms, 4-inch mesh." The number of hospital cots authorised, viz., 3 per cent. of the troops embarked, appears to be sufficient under ordinary circumstances.

The cots at present supplied to transports for hospital purposes are of two kinds—(1) the swinging cot, and (2) the fixed cot. The swinging cot, which is the pattern provided in the better class transports, is composed of an iron framework, with canvas sides and an iron lattice bottom; it is 6 ft. 3 in. long by 2 ft. 1 in. wide. These cots are slung on iron supports securely fastened to the deck at the head and foot of each cot, and are interchangeable as regards their position, so that a patient can be moved from one part of the hospital deck to another, or to the upper deck, without having to be taken out of his cot; by a simple mechanism these cots can be fixed so as to prevent them swinging. Each cot is fitted with two small tables about 8 in. in width, one running across the head of the cot, and the other capable of being adjusted across the middle of the cot or along its side, according to the requirements of the patient. Suspended above each cot is a rope with a wooden handle, by means of which the patient can raise himself in bed.

These cots are on the whole satisfactory, but I would suggest the following improvements:

1. Wire-woven mattresses might with advantage be substituted for the iron lattice bottoms, which are very hard and unyielding.

2. Wooden side-pieces fitting in vertical slots in the iron framework, and capable of being removed, or adjustable iron railings would be preferable to the canvas side-pieces, as the men sit on the latter when getting into and out of bed, and when dressing, and very soon flatten them out, so that they are of no use for the purpose for which they are intended.

3. A receptacle for holding an ordinary glass tumbler should be fitted to the cot table, and a small wire basket made to hang alongside the cot would be found very useful.
These cots are always arranged in a single tier on board transports, and are separated from each other so that they can be freely approached from either side and from one end; they are usually placed end to end in pairs.

It would be a great advantage if the cots were provided with folding iron legs, or if a few pairs of the iron supports on which the cots are slung were fixed in convenient places on the upper deck, as patients who are not able to get up could then be moved in their cots by means of the lift to the upper deck for an hour or so when the weather is suitable, as it usually is in the Tropics. The fresh air and change would be of the greatest benefit to the patients, who could be comfortably moved in the manner described.

The fixed cots are constructed with either an iron or wooden framework, with wooden sides and iron lattice bottoms, and are arranged either singly or in pairs or groups, in single or double tiers, the pairs being placed end to end or alongside each other without any intervening space, an arrangement still existing on some of the hospital ships. Comparatively few of these fixed cots are provided with the small cot tables fitted to the swinging cots. They should be similarly supplied when arranged in single tier, but one small table at the head of the cot and a small wire basket hung alongside would be sufficient when they are arranged in double tiers. Wire-woven mattresses should be substituted for the iron lattice bottoms.

On board the hospital ship "Victor Emanuel," which was fitted out about thirty years ago, a few cots of extra size (7 ft. by 2 ft. 6 in.) were supplied, and similar provision might with advantage be made in our modern transports.

A diet board, on which the patient's extra diet sheet can be fixed, should be supplied for each cot, and should be fitted with hooks by means of which it can be hung at the foot of the cot.

In discussing the question whether cots should be arranged in single or double tiers, several important matters have to be taken into consideration. From a professional point of view double-tier cots are inadmissible for serious medical or surgical cases for the following reasons, some of which have already been brought to notice in condemning cabin hospital accommodation:—

(1) The extreme difficulty involved in moving helpless patients into or out of such cots, when being embarked or disembarked.

(2) The danger of patients in the lower cots receiving the dejecta of helpless cases of enteric fever or dysentery in the upper cots.
Hospitals on Board Transports

(3) The unpleasant results to the occupants of the lower cots when patients in the upper cots are seized with sea-sickness.

(4) The great difficulty experienced by debilitated patients who may be allowed up for a couple of hours daily, in getting into or out of the upper cots for purposes of nature, &c., especially when there is a heavy sea running.

(5) The difficulty experienced by the medical officer in "getting at" a patient in either an upper or lower cot for purposes of examination or treatment.

(6) The loss (half) of cubic space to each patient where double tier cots are provided.

On the other hand, from the transport officer's point of view, there is the loss in cabin and troop accommodation involved by the increased amount of deck space required for a single tier of hospital cots. In June, 1901, the War Office advocated the abolition of the old hospital berths, in which two patients lay alongside one another, and the provision of a certain proportion (1 per cent.) of one-tier cots for serious cases. The increased efficiency of the hospital accommodation brought about by the adoption of these reforms should be found to amply compensate for the loss in the troop-carrying capacity of the transports.

For the reasons already given I do not think any patients, except mild cases and convalescents who are able to be up and about for the greater part of the day, should be accommodated in double-tier cots, and consequently the proportion of one single-tier cot to two cots arranged in double tier appears to me to be too small. As a matter of fact, in the large majority of transports provided with an hospital cot-deck, all the cots are arranged in single tier. In the transport "Dilwara" about 50 per cent. of the hospital cots are so arranged, and they are of the swinging pattern; further, the portion of the deck occupied by the single-tier cots is separated by a bulkhead (with communicating doors) from the part allotted to double-tier cots. This is a satisfactory arrangement, but I think not less than 60 per cent. of the cots should be in single tier, and in those ships in which all the one-tier cots are of the fixed variety, I would suggest half of them being replaced by swinging cots.

As regards the amount of deck space that should be allowed to each hospital cot, I find that in the P. and O. transports "Plassy" and "Assaye," in which all the cots are arranged in
FIG. 1.—PLAN OF HOSPITAL ON BOARD TRANSPORT "SICILIAS."

\( \frac{1}{4} \text{th inch to } 1 \text{ foot.} \)

A. Lavatory enclosure.
B. Separate ward.
C. Dispensary.
D. Hatchway and companion-way.
E. Not included in hospital.
F. Swinging cots in single tier with cot-tables.
G. Mess-tables with seats on each side.
H. Large electric fan connected with air-trunk.
I. Portable electric fan.
J. Fire-hydrant.
K. Washstand "for medical use only."
L. Head of companion ladder to lower deck.
M. Water-closets.
N. Soiled linen tub.
O. Consulting rooms.
P. Water-trunks.
Q. Writing desk.
R. Stationery rack.
S. Compounding table with cupboards and drawers beneath.
T. Filter.
U. Poison cupboard.
V. Ordinary doors.
W. Screens instead of doors.
X. Bath rooms with reclining beds.
Y. Cupboard for patients' medicines.
Z. Cupboard for medical comforts.
AA. Washstand with receptacle beneath.
single tier, the average superficial area allowed to each cot is 63·27 square feet, after deducting the space devoted to the hatchways, companion-ways, dispensary, lavatories, bath-rooms, w.c.'s, dining tables and cupboards, while in the P. and O. transport "Sicilia" it is 77·49 square feet. Owing to the construction of the ships, the cots cannot be evenly distributed over the available deck-space, and are usually arranged in groups of two or three, placed end to end, with from 2 ft. 6 in. to 3 ft. between the sides of neighbouring cots. With efficient ventilation and a height between decks of from 8 ft. to 8 ft. 6 in., the space allowed to each hospital cot on the "Plassy" and "Assaye" may, I think, be regarded as amply sufficient. It is interesting to note that on the main deck of the hospital ship "Victor Emanuel," 36·90 square feet were allowed to each cot, and in the Japanese hospital ship which accompanied the fleet in the war against China, each man was allowed 31·50 square feet of deck space.

On homeward voyages additional accommodation is often provided for convalescent cases by appropriating a troop-deck, and slinging ordinary naval canvas cots from the hammock hooks.

V. Cupboards for Patients' Medicines and Medical Comforts.

Two suitable cupboards are required on the cot-deck, one for the patients' medicines and surgical dressings in daily use, and the other for the medical comforts, including stimulants, ordered for the patients. These cupboards should be provided with good locks, and with shelves fitted to hold bottles securely. The medicine bottles supplied in the regulation pattern medicine chest for dispensing purposes are flat, so that bottle-racks pierced with round holes are not altogether suitable. A drawer for surgical dressings should be fitted in the medicine cupboard, and care should be taken that there is sufficient room between the bottom of the medical comfort cupboard and the first shelf to admit of the easy introduction or withdrawal of an ordinary spirit or wine bottle. A cupboard 3½ or 4 ft. in height, by 2 ft. broad, and 1 ft. in depth, should meet ordinary requirements. Where the hospital consists of more than one ward cupboards of suitable size should be placed in each ward.

VI. Ice-chests.

Ice-chests are provided in the wards of hospital ships and are found to be a great convenience in the Tropics; one might be supplied for the hospital of each permanent transport.
VII. Mess-table Accommodation.

As a rule the hospital dining-table accommodation provided on transports is very deficient, and it is interesting to note in this connection that when the hospital ship "Victor Emanuel" left this country to bring home invalids from the Ashanti war nearly thirty years ago, no tables of any description had been provided on the hospital deck; some were, however, soon fitted up for meals, games, &c. This deficiency in mess-table accommodation is found even in some of the best transports; e.g., in the hospital on board the "Plassy" and "Assaye," each of which ships is fitted with forty-seven cots, there is room for only sixteen patients at the mess-table, and there is no mess-table on the upper hospital deck, where ten cots are located. The other extreme is met with in the hospital of the "Dilwara," which has dining-table accommodation for eighty patients, though there are only sixty-seven cots; and in the "Sicilia," which can accommodate forty-two patients at the hospital mess-tables, though she is only fitted with thirty-five cots. The Admiralty Transport Regulations direct in Appendix I. that "proper arrangements" be made "for the patients to mess," while it is laid down in the specifications for fitting hospitals on transports that "one or more of the nearest mess-tables will be told off for the hospital." It appears to me very undesirable that hospital patients should take their meals on the troop-deck, and this is not often done, but in order to avoid it sufficient mess-tables should be provided in the hospital for 60 per cent. of the sick, i.e., for all the patients accommodated in double-tier cots, and one third of the more serious cases allotted to single tier cots. I do not think this can be regarded as too large an estimate of the number of patients who will be able to get out of bed for their meals during a part or the whole of the voyage.

In ships in which sufficient space is not available in the hospital for mess-tables, the nearest mess-tables on the troop-deck adjoining the hospital should be partly partitioned off for the patients.

VIII. Messing Accommodation for the Detachment of the R.A.M.C.

A separate small mess-table on the troop-deck nearest the hospital is, as a rule, partly partitioned off for the detachment of the R.A.M.C. A small lock-up cupboard is provided in some ships; it would be an advantage if this were always supplied.
Hospitals on Board Transports

Fig. 2.—Plan of Hospital on Main Deck of Transport "Assaye."
(\ 4 inch to 1 foot.

Drawn by G. B. Stanistreet, Capt. E.A.C.M.

A. Lavatory enclosure.
B. Separate ward.
C. Dispensary.
D. Hatchways and companion ways.
E. Not included in hospital.
1. Swinging cots in single tier with cot-tables.
3. Large electric fan connected with air-trunk and opening above cot.
4. Portable electric fans.
5. Fire-hydrant.
6. Washstand "for medical use only."
7. Cupboards for medicines and medical comforts.
8. Drinking water tap and receptacle.
9. Lift.
10. Wash-hand basins with troughs beneath.
11. Soiled linen tubs, one of them partly beneath electric fan stand.
14. Washstand with receptacle beneath.
15. Shelves for bottles.
17. Stationery rack.
18. Compounding table with cupboards and drawers beneath.
19. Filter.
20. Emergency ladder to upper deck.
21. Foot of companion ladder to upper deck.
22. Mast.
23. Water-tight doors.
24. Ordinary doors.
25. Screens instead of doors.
IX. Pantries.

Pantries are usually provided in hospital ships for the washing up and storage of the mess utensils, and are very useful; they are fitted with plate-racks, cupboards, shelves, &c., and should have a sink with hot and cold water laid on. In the absence of a pantry a suitable sideboard should be provided, properly fitted with drawers, cupboards, plate-racks, glass-racks, &c. The sideboards supplied to the hospital ship "Nubia" are of a suitable pattern, and satisfactory.

X. Electric Kettles and Saucepans.

Kettles in which water can be heated by means of electricity or steam—preferably the former—are most useful; one should be fitted on a stand in each ward and provided with a tap through which the hot water can be drawn off.

Electric saucepans are also very useful for preparing soup, beef-tea, &c., for the patients at night, and at other times when the cook's galley cannot be conveniently made use of. One should be supplied in each hospital.

XI. Supply of Drinking Water.

An ample supply of pure drinking water should be laid on to each ward, a drinking-cup being fitted alongside the tap, and a receptacle placed beneath to catch the overflow.

The majority of filters which I have seen on board transports are of the old charcoal or manganous carbon pattern; they should be abolished and Pasteur-Chamberland or Berkefeld filters substituted.

XII. Appliances for Heating and Lighting the Hospital.

Electric or steam radiators, preferably the former, or hot-water pipes, should be distributed through the hospital for heating purposes; they are particularly necessary on homeward voyages from the Tropics during the winter.

The hospital should be well lighted by means of ports, skylights, windows, &c., and should be well supplied with electric light.

XIII. Lavatories, Bath-rooms, W.C.'s.

No provision appears to be made for hospital lavatories, bath-rooms, or w.c.'s in the Admiralty Transport Regulations.
The most convenient arrangement is to have them grouped together in an enclosure, either in a corner of the hospital close to a hatchway, or else immediately outside the hospital on the same deck. Two such lavatories are fitted in the transport "Dilwara"; the after one, which is placed immediately outside the hospital, and extends across the entire width of the deck, is the better arranged of the two, as it ensures thorough cross ventilation and can be completely shut off from the hospital; a similarly arranged lavatory is to be found on the transports "Passy" and "Assaye."

The basins are of enameled iron, fitted in a wooden framework, and made to tip up so that the contents can be emptied into a trough, which lies beneath; cold fresh water is laid on, a tap being supplied over each basin. Hot fresh water should also be laid on, or a tap should be placed in a convenient position.
in the lavatory for the supply of hot water for ablutionary purposes. The metal-lined trough beneath each basin is intended to serve for the washing of hospital linen, and can be made use of by raising the wooden frame in which the basin rests; it would be preferable to have separate troughs provided for the purpose, as in the P. and O. transports "Plassy" and "Assaye." In some ships I have seen the basins fitted in a framework over the bath, into which they are emptied; this is not a satisfactory arrangement. A looking-glass should be supplied in the lavatory.

The w.c.'s are of the ordinary ship's pattern provided for first-class passengers, and are supplied with a good flush of water; they are placed against the vessel's side and are satisfactory, but a door should be substituted for the canvas screen hung in the doorway of each w.c., to enable it to be completely shut off from the lavatory enclosure and hospital. The seat should be made to lift up, so that the closet can be used as a urinal, and the floor should be impermeable. Trough w.c.'s are not suitable for hospital use and are rarely provided for the purpose. Objections have been raised to having the w.c.'s in such close proximity to the hospital, but if they are of a good pattern, placed against the ship's side, with air-tight bulkheads and closely fitting doors, and properly ventilated by means of port-holes and up-cast air-trunks, I do not think they are ever likely to be offensive, while the great advantage of having them close to the hospital is that they can be used by a larger number of patients than if they were placed at a distance, or on the deck above, and the desirability of every patient, except those entirely confined to bed, using the w.c. instead of a Fyffe's chair in the hospital is obvious. In one ship which I inspected not long ago I found the w.c.'s situated on the deck above the hospital, and approached by an extremely steep gangway, so that they could not be reached except by patients well advanced in convalescence, and then only in the event of the sea being comparatively smooth.

The hospital baths are of the usual full-sized reclining pattern, and have both fresh and salt water laid on, as well as steam for heating purposes. The fresh water taps are provided with padlocks to prevent waste. Similar baths are fitted in the P. and O transports, and are satisfactory, but a considerable number of hospital baths in other transports have only cold salt water laid on, which is of little use for hospital purposes, while in some of
those provided with fresh water taps no fresh water is obtainable. A large number are without steam for heating purposes—I have found this to be the case even in hospital ships. With the facilities provided in modern steam-ships for distilling and storing water there should be no difficulty in providing a sufficient supply of fresh water for the hospital baths, and consequently these should have fresh water laid on as well as salt, and should be supplied with steam for heating purposes, unless hot fresh water be laid on. The necessity for having hospital baths supplied with fresh water as well as salt, and with steam for heating purposes, was recognised in fitting out the hospital ship “Victor Emanuel” nearly thirty years ago. The salt water taps often leak owing to the action of the salt water.

The greatest differences exist as regards the scale of baths, wash-hand basins, and w.c.’s supplied for hospital purposes. The number of baths varies from one for forty cots to one for fifteen to sixteen cots, while the scale of basins provided in the lavatory has been found to vary from one for every twenty cots to one for five to six cots, and the number of w.c.’s from one for every forty patients to one for every seven or eight patients. The following scale should be found to meet all requirements:

- One bath for every fifteen to twenty cots.
- One basin for every eight to ten cots.
- One w.c. for every ten to twelve cots.

A varying number (3 to 19 per cent.) of washstands, most of them with cold water laid on, are to be found distributed round the hospital with a notice “for medical use only” painted above them; these are presumably intended for the convenience of the sisters or orderlies engaged in washing patients who are confined to bed. A suitable number of enamelled iron basins (say one for every ten cots), to be kept in a convenient place in the hospital lavatory, would answer the purpose equally well.

XIV. Wash-places for Use of the Medical Staff of the Ship.

Some of the washstands referred to above are generally made use of by the medical staff of the ship. Two washstands placed in a convenient position on the cot-deck would suffice for the purpose—one for the medical officers and sisters (if any), and the other for the orderlies. The ordinary shut-up cabin washstand is sometimes supplied, or an enamelled iron basin set in a wooden
frame and provided with taps placed above it, through which a good supply of fresh water (hot and cold) is obtainable, would answer the purpose satisfactorily.

XV. Means for Disinfecting and Washing Hospital Clothing.

Two large soiled linen tubs, either of galvanised iron or wood, preferably the former, are required for disinfecting hospital clothing, and are supplied in the better class of transports, where they are fixed in the lavatory enclosure, in which a couple of troughs for washing the disinfected clothing should also be provided, with fresh water (hot and cold) laid on. These troughs would be available for washing ordinary hospital clothing when necessary. Such troughs, but with only cold water laid on, are provided in the lavatory enclosure on the upper deck of the "Plassy" and "Assaye," and are to be found in many transports beneath the basins; the latter cannot be considered an altogether satisfactory arrangement. I think it would be a good plan to have the soiled linen tubs and washing troughs placed in the soiled linen room to be referred to later on, where arrangements might be made for drying the hospital clothes after washing.

The R.I.M. transport "Hardinge" is provided with a steam and hot-air disinfecting chamber, and it would be an advantage to have similar chambers fitted in all ships permanently engaged in transport work.

A galvanised iron sanitary bin fitted with a lid is provided in the after lavatory of the "Dilwara," and on the upper hospital deck of the "Plassy" outside the bath-room, but the necessity for such is not much felt.

XVI. Dispensary and Office.

More than half of the specification laid down in the Admiralty Transport Regulations for fitting hospitals on board transports is devoted to a description of the dispensary, and a two-page plate of drawers and a stand for bottles is added, this being the only plan given of any of the hospital fittings. The specification in question makes provision for a dispensary 6 ft. square, with a door 3½ ft. wide fitted with a lock, and directs the supply of two drawers, 3 ft. long, to be surmounted by three shelves to hold eighteen bottles, varying in diameter from three to six inches.
Provision is further made for an additional shelf 6 ft. in length (also for bottles), and for a suitable washstand and basin, water-can and receiver, also a camp-stool, a swinging candle-lamp, and a filter of approved description. Such a dispensary would fall very short of modern requirements, and the specification is no longer adhered to in fitting out the better class of transports; still it is adhered to in some instances, and it consequently stands in need of revision.

The following are some of the defects I have observed in inspecting the dispensaries on board transports—deficiency in size, there being no room for the regulation pattern medicine chest, and the door being often too narrow to admit it; deficiency in the number of cupboards and drawers provided for medicines and surgical materials, the absence of a water supply and sink, and the unsatisfactory pattern of filter supplied.

There are two dispensaries on board the "Plassy" and "Assaye"; this is unnecessary, as one dispensary is quite sufficient, and that on the hospital deck with a few improvements should be found to fulfil all requirements. This dispensary occupies a space 10 ft. by 8 ft., is sufficiently large and is very well fitted with cupboards and drawers and shelves for bottles. There is an excellent compounding table 6 ft. long by 2 ft. wide, at the back of which are placed shelves fitted for the reception of forty bottles of various sizes; beneath the table are two cupboards (32 in. high by 23 in. wide), one on either side, each being fitted with two shelves, and between the cupboards are three large drawers (22 in. wide) placed one above the other. There is an additional cupboard at the opposite side of the dispensary, measuring 31 in. in height by 30 in. in width, and fitted with three shelves for bottles. This cupboard is provided with a lock and might be set apart for poisonous drugs, &c. The dispensary is further supplied with a steam hot-water kettle, stationery rack, wash-place, and filter; it is ventilated by means of a port-hole and a special up-cast air-trunk, and is well lighted by electricity.

The iron upright which is placed just inside the door and which prevents the admission of the medicine chest, should be removed, and a suitable place should be allotted to the medicine chest. A sink is required, and water should be laid on with a tap above the sink to facilitate the washing of bottles, &c. A Pasteur-
Chamberland or Berkefeld filter should be substituted for the manganous carbon filter at present supplied. An electric steriliser should be provided, and an electric kettle would be preferable to a steam kettle. With the improvements indicated above this dispensary might be taken as a type of dispensary suitable for permanent transports, and it is with this object in view that I have entered into so much detail. An arrangement which I saw on the transport "Victorian" struck me as a good one. In that ship the dispensary door is divided, so that the upper half can be opened independently of the lower half; by opening the former and keeping the latter closed medicines can be conveniently issued to men attending hospital, and they are prevented from entering the dispensary.

The other dispensary on board the "Assaye" and "Plassy," which is located in a deck-house on the upper deck, and which is used both as an office and a dispensary, might be entirely converted into an office, where the medical officer in charge could see and examine men reporting sick, and where the office work of the hospital could be conducted. The want of an office is greatly felt on those transports which are unprovided with such. It should be properly fitted with a couple of office tables, lock-up drawers, stationery-rack, shelves, &c. If it should be found impracticable to provide an office in the majority of transports, the dispensary should be slightly enlarged to enable the office work to be conducted in it, and should be fitted with a suitable office table with lock-up drawers.

XVII. Hospital Store-rooms.

Store-rooms for hospital clothing, hospital stores and equipment, soiled linen, and invalids' effects are provided close to the hospital, usually on the deck below in the better class of transports, and are very necessary. They should be about 10 ft. by 8 ft. in size, and should be provided with wide doors and fitted with racks and shelves. I have already made some remarks about the soiled linen room in discussing the means for disinfecting and washing hospital clothing; this room is usually lined with zinc or tin, which is a good arrangement. Great inconvenience is experienced in transports unprovided with these hospital store-rooms. The purpose for which each store-room is set apart should be indicated on the door to prevent misappropriation, and each room should be well supplied with electric light.
Hospitals on Board Transports

XVIII. Ventilation.

The regulations for H.M.'s Transport Service direct each deck to be separately ventilated, the decks being cut for air-trunks and funnels wherever necessary; it is further laid down that large movable cowls are to be fitted to all funnels, and that to ensure proper ventilation the funnels are to be arranged in pairs, one being brought down to within a foot of the deck, and the other cut off close to the deck above, thus furnishing an uptake and down-draught, the air-trunks being made to act in a similar manner. Provision is also made for the fitting of iron air scoops to the scuttles so that they can be easily shipped and unshipped, and it is laid down that any other system of ventilation that may be ordered will be outside the contract and must be specially arranged for. A description is given in one of the Appendices of Edmond's "System of Ventilation," in which foul air is extracted by means of steam jets creating a vacuum in the upper ends of outlet or upcast air-trunks, which are connected with a system of perforated air-shafts running fore and aft between decks. This system can, it is stated, be used either to exhaust foul air or diffuse cool air, the latter object being attained by shutting off the steam jets and turning the cowl to the wind.

I do not propose to discuss the question of ventilation on shipboard in detail, as it is fully dealt with in Notter and Firth's "Hygiene," while Fleet-Surgeon Kirker, R.N., and Lieut.-Colonel A. M. Davies, R.A.M.C., have recently investigated the system of ventilation of transports, and have written a full report on the subject. These authorities advocate the propulsion system of ventilation, in which an abundant supply of absolutely pure air is introduced between decks by means of electric fans fitted in the lower ends of inlet or down-cast air-trunks, and, except for w.c.'s and places where hot and foul air is generated, they condemn Edmond's system of ventilation by exhaustion, as, even if the foul air be effectively removed, there is no control over the source of the air coming in to replace that which is being withdrawn. They point out that this system should never be used for the supply of air owing to the accumulation of dirt in the air-trunks caused by the frequent passage through them of foul air in the process of extraction. The expediency of placing the propulsion fans at the ends of compartments most remote from the hatchways, and of arrangements being made for the fresh air to be delivered horizon-
tally against the bulkhead instead of towards the hatchway, is pointed out; by adopting this method the air is better distributed, draughts are diminished, and patients in the neighbouring cots do not have the air impinging directly on them. Outlet shafts should be provided at as present, and all unnecessary bends in air-trunks avoided.

The conclusions finally arrived at in Kirker and Davies' report are that the usual means adopted for natural ventilation, viz., port-holes with airscoops, hatchways with or without wind-sails, skylights, and air-trunks fitted with cowls, are sufficient on the upper deck, while on the main deck these means should be supplemented by electric propulsion fans, the latter being depended on for the ventilation of the lower deck, and that Edmond's exhaustion system when fitted on this deck should be worked continuously instead of only occasionally, and should be used in conjunction with the propulsion fans supplying fresh air. McWhirter's portable electric fans unconnected with air-trunks are not of course true ventilators, but they help to circulate the air in the hospital and are very cooling and refreshing. They should be supplied in all transports in the proportion of one to about every five cots.

The chief defects which I have found in the ventilation of the hospitals on board transports are (1) the absence in some cases of electric propulsion fans fitted in inlet air-trunks; (2) when provided, they are not always located to the best advantage, and in many instances deliver the fresh air towards the ward, so that it impinges directly on the neighbouring cots; (3) the electric fans, if worked continuously in the Tropics, are apt to get out of order through charring of the insulating material surrounding the wire, and from other causes; (4) the Edmond's exhaustion system, when fitted, is in some instances used for the supply of fresh (?) air—I have seen instructions to this effect fixed to air-trunks on a hospital ship; (5) the hospital has in some cases been found to communicate with troop-decks by means of hatchways, ventilating shafts, and apertures in bulkheads; (6) the absence of portable electric fans.

**XIX. Means for Isolating Cases of Infectious Disease.**

No provision is made in the regulations for H.M.'s Transport Service for the accommodation of cases of infectious disease, though the importance of being able to isolate such cases on board ship
effectively and without delay can hardly be over-estimated, as the speedy detection and prompt isolation of the first case or two may prevent a dangerous epidemic from spreading through the ship. I find it stated in a description of the hospital ship "Victor Emanuel" that arrangements could be made for walling in and roofing with canvas the portion of the poop behind the mizen-mast for the reception of cases of infectious disease, and notwithstanding the great advances made in sanitary arrangements during the last thirty years, little progress appears to have been made in the matter of providing accommodation for infectious cases on board ship, and the arrangements for isolating such cases have usually to be improvised.

The "Maine" is the only hospital ship I have seen provided with a "zymotic ward," though I have found an upper-deck cabin set apart on one or two transports for the accommodation of cases of infectious disease. Now, I think there is no doubt that means for the isolation of such cases are more necessary on board transports than in hospital ships, for cases of infectious disease are more likely to appear amongst troops who have been free to go about garrison towns prior to embarkation, than amongst men who have been in hospital for some considerable time, and who are transferred thence to the hospital ships in which they are conveyed home.

Under all the circumstances of the case, and even at the sacrifice of the necessary amount of space, I think suitable accommodation should be provided on the upper part of the upper deck for isolating cases of infectious disease. A well-ventilated wooden deck-house sufficiently large to contain three or four cots in single tier, and fitted with all the necessary appliances, including a small attached lavatory, containing a couple of wash-hand basins, bath-room and w.c., should answer the purpose, the principles already advocated in the foregoing pages being followed in arranging and fitting the accommodation. If in any particular transport it should be found impracticable to reserve special accommodation for the isolation of cases of infectious disease, definite arrangements should be made beforehand to give up or improvise suitable accommodation for the reception of such cases in the event of their appearing.

XX. Accommodation for Sick Women and Children.

The Regulations for H.M.'s Transport Service direct that a hospital is to be provided for women when ten or upwards are
carried, one berth being allowed for every twenty adults after the first ten. The hospital is to be "built and fitted as specified for families of N.C.O.'s, Class 16, size as for officers' cabins," an additional hospital being built when more than six berths are required. In Class 16 accommodation, the necessary space is bulkheaded off, the berths being arranged in two tiers with a seat running along the lower berths. Provision is made for washstands and, when more than four are fitted for, a bath with salt water supply, and washing trough with fresh water supply. A separate, specially well-ventilated w.c. is to be provided for the hospital, the door when practicable communicating with it.

On board the transports "Plassy" and "Assaye," a women's hospital is provided in a suitable position, with four cots in single tier, a properly fitted washstand, and adjoining bath-room and w.c. Two portable electric fans are also provided, and a camp-stool is authorised for each berth.

In the ships permanently engaged in the transport service, a women's hospital should be provided with the necessary number of cots in single tier, and it should be fitted and arranged on the lines laid down in the foregoing pages for the provision of hospital accommodation for men. The washstand might be conveniently placed in the bath-room, the latter intervening between the hospital and the w.c.

XXI. Accommodation for Sick Officers.

No hospital accommodation is provided on board transports for sick officers, in consequence of which they have to be treated in their cabins, an arrangement open to very serious objections, as already brought to notice in dealing with the question of hospital accommodation for men. There is no doubt that a certain proportion of sick and invalided officers can be more or less satisfactorily treated in cabins, and preferably in cabins set apart for the purpose, but special arrangements are essential for dealing with serious medical and surgical cases amongst officers. This principle has been to some extent recognised in hospital ships by the provision of an officers' ward equipped with six single-tier cots, and I think a similar arrangement might reasonably be extended to transports, in which a few (say four) single-tier cots should be partitioned off for the accommodation of serious cases amongst officers. This officers' ward should be equipped and arranged in
Hospitals on Board Transports

a similar manner to the men's hospital; it should be provided with a small pantry, and should have a lavatory attached with basins, bath-room, w.c., &c.

XXII. Accommodation for Lunatics.

In those ships in which accommodation for lunatics is provided, it consists of about eight single padded cells situated alongside the prisoners' cells. In some of the transports in question it was noticeable that the padding had become so hard from repeated painting that it was of comparatively little use for the purpose for which it was intended. Willesden waterproof canvas might with advantage be substituted for the painted canvas generally used. Comparatively few of the lunatics, however, require to be confined in padded cells, and such accommodation is not likely to improve the mental condition of the patients, the majority of whom might be more suitably accommodated in a special lunatic ward under proper supervision. A portion of the upper deck is usually set apart for the lunatics to enable them to get exercise and fresh air, and is surrounded by wire netting or lattice work to prevent accidents.

XXIII. Miscellaneous Points.

An operation room and mortuary are provided in hospital ships, but are hardly necessary on board transports.

An open rack is provided on the hospital deck of some transports for the stowage of the wash-deck gear; this is not a satisfactory arrangement, and the gear in question might be more suitably kept in a special cupboard beneath the companion-ladder, or in some other suitable recess.

Hooks for the patients' clothing are usually distributed throughout the hospital in convenient places, and are very necessary.

The iron deck forming the ceiling of the hospital should be painted with "cork-paint" to prevent condensation of moisture.

XXIV. Hospital Accommodation in Troop Freight Ships.

Before concluding this Report I should like to make a few remarks on the fitting of hospitals on troop freight ships. These ships often carry 300 to 400 troops or more, and are provided with the barest necessities in the matter of hospital accommodation, viz., the authorised number of berths, a bath with two basins fitted over it in a wooden frame, one or two w.c.'s, and a dispensary. The
hospital is usually fitted up in a corner of a troop-deck, and is partitioned off by wooden bulkheads, through the windows and openings of which it communicates freely with the troop-deck. The following are some of the other defects which I have observed in inspecting these ships. The cots are always arranged in two tiers, and have no cot tables; no cupboards are provided in the hospital for the patient’s medicines or medical comforts, and no store-rooms outside for hospital stores; narrow doorways, and other obstructions, as well as steep and narrow gangways, render the disembarkation of stretcher cases very difficult in many instances; no portable electric fans are provided; the bath is, as a rule, supplied with cold salt water only; the dispensary is often too small to admit the regulation pattern medicine chest, and has no water supply laid on; in some of these ships no separate mess is provided for the detachment of the Royal Army Medical Corps, and the mess table accommodation for patients is very deficient. I do not of course expect to see these ships, whose hospital arrangements are only of a temporary nature, fitted up like transports, but I think a rather higher standard of hospital arrangements than is found at present might reasonably be attained.