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### Continental Regulations for the Transport of Sick and Wounded by Rail

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## CONTINENTAL REGULATIONS FOR THE TRANSPORT OF SICK AND WOUNDED BY RAIL.

*By Surgeon-Captain C. H. MELVILLE, A.M.S.*

### INTRODUCTION.

THE carriage of sick and wounded men by rail is a question the importance of which, to the military no less than to the medical officer, cannot be over-estimated. On the Continent the arrangements for the systematic removal by these means of disabled men from the front to the base of an army in the field are excessively elaborate; fully-equipped hospital trains being kept in readiness in time of peace, stores for the rapid improvisation of others being accumulated in the mobilisation depôts, and instructions issued whereby ordinary trains may without further alteration be utilised for the transport of cases whose condition is not such as to demand special accommodation, or whose removal is a matter of such urgency as not to permit of the delay necessary for the provision of the same. The question does not appear to have received the same amount of attention in our own Service, whether at home or in India; and from my experience but little is known in our Army of the principles which regulate the formation and working of Hospital Trains outside the somewhat limited circle of staff and other specialist officers, whose work has brought them into immediate contact with the subject. It has appeared to me, therefore, that a short consideration and comparison of the Regulations for the Transport of Sick and Wounded by Rail, as laid down in four of the leading Continental Armies (viz., the German, French, Austrian, and Italian) might not be without interest and perhaps instruction.

I have followed the classification of Hospital Trains used in the French Service as far as the names of the three classes go, viz., Permanent Hospital Trains, Improvised Hospital Trains, and Ordinary Trains.

### PERMANENT HOSPITAL TRAINS.

Synonyms.—German: *Lazareth-Züge*. French: *Trains Sanitaires Permanents*. Austrian: *Eisenbahn-Sanitäts-Züge*. Italian: *Treni Ospedale*.

These trains are in all cases units of a permanent nature. They are composed of carriages specially built, or specially fitted up in a permanent manner for the performance of special functions, e.g., as kitchens, store-rooms, rooms for establishment, carriages for sick, etc. These carriages are arranged in a definite order, which is not allowed to be

interfered with, except under special circumstances. Permanent Hospital Trains are provided with a permanent establishment and equipment, and are intended for the transport of such cases only as demand not only lying-down accommodation, but also more or less constant attention.

The formation and size of the trains differ in the different Services, and for purposes of ready comparison the details have been tabulated in Appendix A. Here it will suffice to state that the German trains consist of 41 carriages, of which 30 carry sick; the French of 23, of which 16 carry sick; the Austrian of 19, of which 13 carry sick; and the Italian of from 19 to 24, of which 12 to 17 carry sick. The carrying capacity of these trains is as follows:—German 300 sick, French 128, Austrian 104, and Italian 200. The size of the Italian carriages varies, but the number of sick carried is constant, hence the variation above noted in the number of the carriages. The relative carrying power calculated in the number of patients conveyed per axle in the entire train (exclusive of engine and tender) is for the German train 3·66, for the French 2·78, for the Austrian 2·74, and for the Italian 3·87, when large carriages are used (counting each sick carriage at 4 axles), with a slightly higher figure for small carriages, supposing these to possess only 2 axles each. In addition to the above regular trains, the trains of the Société Française and of the Austro-Hungarian Knights of Malta may be mentioned; the former made up of 26 carriages, of which 20 are for sick, and the latter of 16 carriages, of which 10 are for sick. The former carries 300 sick lying down or 500 sitting up, and the latter carries 100 lying down. All Hospital Trains are provided with through communication from carriage to carriage; in the German and French trains the first and last carriages (baggage, etc.) are cut off from the rest; in the Austrian the first waggon only is thus separated; in the Italian train, the communication is complete throughout. This communication is ensured by connecting bridges passing from the rear of one carriage to the front of the carriage immediately behind; these bridges are protected by removable railings in the German, Austrian, and Italian trains. In some Italian carriages these railings are fixed, thereby causing much inconvenience during the entraining of sick.

The German trains are distinguished each by a number, and on both sides of each carriage, near the roof, a red cross on a white ground, 13 to 15 inches square, is painted, and underneath this the designation and number of the train; thus "Lazareth-Zug No. ." In addition each carriage bears, both in and out, a serial number from 1 to 30.

In the French Service, each carriage bears the inscription "Train Sanitaire Permanent No. ," and the Geneva Cross. The carriages of the Austrian train are marked with the Geneva Cross above, and below with number of the train and the special designation of the carriage, e.g., "Arztwagen," "Krankenwagen," etc. These marks are placed on both sides of every carriage, except the goods waggon, the first carriage of the train. The Italian trains carry the Geneva Cross on a metal plate; also the national flag and lanterns of neutrality, but neither

flags nor lanterns are used except when in proximity to the enemy, as being apt to be confused with railway signals, and thus cause danger.

The sick carriages carry in the German Service 10 patients each; in the French Service, 8; (16 in the carriages of the Paris-Lyon-Méditerranée Line); in the Austrian Service, 8; in the Italian Service, a number varying with the size of the carriages, from 12 to 18.

The class of carriage used is, as a rule, a baggage waggon, or a passenger carriage with no elaborate fittings; these fittings are removed or adapted, and the carriage fitted up in a special manner, varying in the different Armies.

In the German trains ordinary 4th Class passenger carriages are used, which possess two-leaved doors at both ends. The stretchers used are the ordinary field-stretchers provided with mattresses and bedding. The lower three stretchers on one side of the carriage are provided with side-pieces, which increase the breadth of the bed thus formed by about 8 inches, the total breadth with this addition being 2 feet 9 inches. These stretchers are arranged in two tiers, six on one side and four on the other; the space thus left empty on the latter side is filled by a stove, water barrel, occasional table, etc. The stretchers are suspended by a spring-hook apparatus to hooks fixed in the walls and supporting pillars of the carriage.

Above each berth is a netting on the roof or side wall for the reception of the minor effects of the patient, and straps are also provided to assist patients to raise themselves in bed. The carriages are provided with oil lamps, and a lantern is also allowed for every carriage. Ventilation is secured by inlets in the roof and louvred openings in the side walls and doors. To each carriage five portable commodes are allowed; these may, if necessary, be kept, when not in use, on the communication platforms, care being taken that they are securely fastened. The doors of the carriage are curtained, and the passage down the centre covered with cocoanut matting. In the French Service special goods waggons are used, provided with sash windows; the springs and couplings are modified to suit the more delicate nature of the traffic for which they are now to be adapted. The stretcher used is a special one called the *lit-brancard*; it is provided with a mattress and bedding, and is suspended from hooks on the walls and supporting pillars of the carriage. The bed of the stretcher is formed of interwoven webbing. The stretchers are arranged in two tiers, four at each end of the carriage, the centre clear space being occupied by the stove, etc. Lighting and ventilation are provided for by a lantern in the roof, and sash windows in the doors and side walls. Light at night is furnished by an oil lamp and a hand lantern. One commode is allowed per waggon.

The Austrians use ordinary baggage or goods waggons. Special stretcher beds (*trag-betten*) are used, and are provided with mattresses and pillows, which are kept rolled up until required for use. Two tiers of stretchers are arranged in each carriage, the upper tier being suspended by webbing straps to hooks fastened in the outer wall of one waggon, with cushions so arranged as to prevent jarring of the stretcher against the

wall. The system is a modification of the Italian and Swiss system, which is described in detail when discussing the improvised Hospital Trains of the Italian Service. The lower tier of stretchers rests immediately on the floor of the waggon. Lighting by windows and lamps, ventilation by door and windows, and, if necessary, by special appliances. Warming ensured by a stove. One commode, opening through floor of the waggon on to the track, is supplied; also a receptacle for dirty linen, etc.

The sick carriages of Italian trains are adapted from passenger carriages which have doors at both ends at least 31 inches in width, are provided with detachable railings to the communicating bridges (this condition, as will be noted hereafter, is not always adhered to), and possess sufficient means of ventilation. The stretchers are arranged in two tiers on brackets which project from vertical uprights; the uprights are firmly braced to the walls of the carriage. Each vertical upright supports two brackets, one at a height of 4 feet 6 inches, the other of one foot from the floor of the carriage. Each bracket projects to a distance of 29 inches from the uprights, and is curved upwards at the termination; it is thus long enough to support both handles at one end of the stretcher, whilst the turned-up end prevents the handles from being dislodged. The stretcher used is a special one called the *Barella-lettuccio, sistema Tosi*. This consists of two poles, each about 7 feet 6 inches long, kept apart by iron traverses. These traverses are not fastened directly to the poles, but to arched iron supports, which form not only feet, but head and foot rails to the stretcher; the poles pass through rings in the arched supports. The bed of the stretcher is formed of a double layer of stout canvas, which passes round both poles, and is laced to the head and foot rails. The length of the bed thus formed is a little over 6 feet, and its breadth about 2 feet; the stretcher handles, formed by the ends of the poles, project about 9 inches beyond the traverses, they are slightly knobbed at their extremities on the under-surfaces; this no doubt adds to the security of the stretcher when placed on brackets. The uprights at either end of a carriage should not be less than 18 inches from the wall, and the distance between one upright and the next on the same side must be rather over 6 feet 6 inches. It follows that every bracket, except those on the uprights at the end of the carriage, must support the foot end of one stretcher and the head end of another. Each bed is provided with a mattress, bolster, and pillow. The ordinary means of lighting are used, and a hand lantern per carriage is also allowed. One commode is allowed for every carriage.

The carriage for the medical officers of a train is in all Services specially fitted up for use as a sleeping carriage, or else a specially-built sleeping carriage is supplied. For the subordinate establishment the Germans provide two carriages; the other Services one only. These are, as a rule, fitted up in a manner similar to the carriages for sick. It is not anticipated that this accommodation will be sufficient to provide for the entire establishment; those on duty will sleep in the sick carriages, either on the floor, or in an empty berth, should one be available; others in the kitchen, store, or dispensary waggons,

The kitchen waggon is very elaborately fitted up in all Services; the plates in the German Field Medical Regulations (*Kriegs-Sanitäts-Ordnung*, 1878, Bl. III.) give one, perhaps, the best idea of the nature of these waggons.

The importance of this waggon lies in the fact that the size of the train must be practically limited by its capabilities in the matter of furnishing hospital diets. The waggon is so highly specialised and so expensive that it is obvious that the train must carry as many patients as can be dieted from one such waggon, but no more. To carry fewer would be false economy as wasting power; to carry more is impossible, for it must be remembered that the two main points in which a permanent Hospital Train presents a superiority over an improvised one are:—1. The through communication from carriage to carriage. 2. The fact that the running and timing of the train need not be subordinated to the necessity for stopping to feed the patients.

This last advantage would, of course, be lost at once if more patients than could be satisfactorily fed from the kitchen waggon were carried.

The establishments of Hospital Trains, in the various Armies, are shown in Appendix B.

The following particulars may be noted here:—

The proportion of medical officers to patients in the German train is 1·3 per cent., in the French 1·5 per cent., in the Austrian and Italian about 2 per cent. The Italian carries in addition a director, who relieves the S.M.O. of all administrative duties. As regards subordinate establishment, the Germans allow only a little over 10 per 100 patients, while the other Armies allow about 20 for the same number.

(The obvious fault in the German system would seem to be the short allowance of cooks; one cook and an assistant seem barely sufficient to prepare diets for 300 patients as well as cooking the rations of the establishment. The Italians, with two-thirds the number of patients, have two cooks and two kitchen servants; the Austrians two cooks for only 104 patients. Apart from this consideration, the allowance of one attendant to every 10 patients ought to be sufficient.)

In Germany, those trains, for which materials have been collected in time of peace, are, on the outbreak of war, made up, mobilised and handed over to the P.M.O. of the Field Force for distribution subsequently amongst the various sections of the lines of communications. The rolling stock necessary for making up additional trains will be got together on the recommendation of the P.M.O. with the sanction of the Inspector-General of Railways and Communications, by the Chief of Military Railways. The station of mobilisation will be fixed by the War Ministry, and the necessary equipment will be furnished either directly by the same authority from Army Stores, or procured locally by the P.M.O. and Intendance. Additional equipment may be procured if necessary from the railway management through the War Ministry. The local intendant arranges for the provisioning of the train.

In France the different railway companies are intrusted, in time of peace, with the duty of providing and taking care of the special fittings

and furniture necessary for the adaptation of the various waggons, and the Medical Department with the provision and storage of the professional equipment. The companies are bound to provide the trains, properly fitted out, at ten days' notice, and the medical authorities to have their work complete in five. The fitting-up of the train will be supervised by an *Officier d'Administration*, if possible the same officer who will subsequently do duty with the train. Four reserve waggons are provided with every train, and kept till wanted in the depôts in Paris.

The Austrian Hospital Trains are mobilised at various railway stations where large workshops are available. The regulations draw a clear distinction between the technical and professional fitting-out of the train, the former being more particularly the work of the railway authorities, the latter that of the Medical Department. A medical officer is told off as commandant to each train, and he superintends and is personally responsible for the proper fulfilment of the latter duty. He takes the train over when complete, in which performance great care is particularly enjoined.

The Hospital Trains of the Italian Army are worked by the Aid Societies (the Italian Red Cross and the Sovereign Military Order of Malta). On mobilisation the Ministry of War directs the railway companies to collect the rolling stock necessary at certain named stations. The waggons are there stripped of seats, and all unnecessary internal fittings, and handed over to the society for equipment. The society provides the entire equipment of the train, but is not allowed to vary the type of stretcher, or the method of suspension used, without the special sanction of the Ministry. The actual fitting-out of the train is superintended by a delegate of the society, assisted by a military officer.

In the German Army the Committees for Transport of Sick and Wounded indent on the P.M.O. of the Field Force for the number of Hospital Trains they require; that officer then, in consultation with the director of field railways, tells off the trains at his disposal to the various sections of the lines of communications, in compliance with the above indents. Subsequently to this, the trains run under the orders of the Military Railway Direction generally, and of the Line-Commandant locally. Sick-transport committees acquaint the military railway authorities, from time to time, with their wants in the matter of railway transport, and are, in turn, kept informed by the latter of all changes in the general traffic arrangements. The S.M.O. of the train, who is also its commandant, receives from the committee his orders as to where he is to entrain sick.

In the French Service, the medical officers in charge of evacuation hospitals report daily to P.M.O.'s the number of patients awaiting removal. The local details of traffic management are arranged by the P.M.O., the Director of Communications, and the Railway Committee. These authorities correspond daily on all matters affecting the working of the evacuation system.

The general management of all movements of trains, in connection



with the evacuation of sick, is regulated by the Director of Railways and Communications, in consultation with the War Minister.

In the Austrian Service the Staging Committee, acting on the returns sent by the different reserve and field hospitals, makes out a statement of the number of cases awaiting transport for the information of the Railway Management. The latter makes the necessary traffic arrangements, and informs the Staging Committee of their nature, the committee passing on the information to the Road Commandant.

In the Italian Army the medical officer of the despatching hospital indents on the P.M.O. for a train; this indent is passed on to the intendant, and through him to the Director of Transport. This latter officer decides on the class of train to be employed, and, in the case of a permanent Hospital Train being required, informs the delegate of the Aid Society attached to the intendant's staff, who in his turn orders the director of the train selected to carry out the movement.

Sick and wounded do not in any Service come under the care of the S.M.O. of the train until they arrive at the railway station; up to that point the committee for transport of sick and wounded, or the medical officer of the evacuation or field hospital, is responsible for all arrangements, using as a rule requisitioned carriage for the purpose. In the Italian Service it is laid down that should the hospital be close to the station, the railway stretchers may be sent for the patients, the discharging hospital merely supplying the men to carry the stretchers. In all Services the S.M.O. in charge of the train is supposed to personally superintend the entraining of patients.

In the German Service the following rules are laid down:—Patients should, as a rule, travel with their heads in the direction in which the train is proceeding, but this may be varied when it is necessary so to place the patient that a particular side may be towards the centre of the carriage. The S.M.O. will decide which cases are to be changed on to the train-stretchers when in the carriage and which must be transferred before entraining. The coupling chains must be let out to such an extent as to leave a space between carriages equivalent to the length of a stretcher. Before loading up, the stretchers will be placed on the ground at right angles to the direction of the train, and opposite to the space between two carriages, the foot end towards the train. The four men necessary for loading now take post as follows:—Number 1 on the platform of the carriage; numbers 2 and 3 on the right and left of the stretcher, at its foot; number 4 between the handles at the head of the stretcher. Numbers 2, 3, and 4 now raise the stretcher and bring it up to the platform of the carriage, where number 1 seizes the foot end, and number 2 getting on to the carriage platform grasps the head end as it is passed to him. The stretcher is now carried into the carriage, and the patient transferred, if this has not already been done, to the train stretcher. The upper tier is loaded first. Severe cases, especially fractures of upper and lower extremities, are placed on the broadened stretchers already described, otherwise the lower tier of berths will be reserved for such cases as are able to get up.

In the French Service the following rules are laid down:—The patients will be undressed and put to bed on the train stretchers (*lits-brancards*), some convenient waiting or other room in the station (warmed if necessary) being used for the purpose. The four men of the stretcher detachment then carry it to the waggon, and place it at right angles to the latter, and opposite the door, with the head leading. They then again lift it by the rope handles attached to the poles, two men standing on each side advance and place the head end on the floor of the carriage, the numbers at the other end taking care to keep the stretcher level by raising their end. The men at the head end then climb into the waggon, and the stretcher is then pushed in towards its berth till the whole stretcher is resting on the floor of the carriage. The two foot numbers then climb in, and the stretcher is again lifted and carried to its berth, and placed exactly opposite the latter. The stretcher is then again lifted and placed on its supports.

The manœuvre is altogether very elaborate: the stretcher has to be laid down and taken up again three times during the process, and this entails considerable work on the bearers. The upper tiers are loaded before the lower.

In the Austrian service very elaborate directions are given, which seem worth relating in some detail. A small party, under an officer if possible, is told off to see that all necessary preparations are made for loading up, a suitable platform selected, the train brought up, and ramps or gangways provided (much stress is laid on this point, which undoubtedly facilitates rapid loading). The loading party itself should be ready at the station one hour before the arrival of the patients, to render assistance in preparing the train for their reception. This being done, the different stretcher detachments are told off. Patients, on arrival, are distributed to the different carriages and berths, under the personal superintendence of the commandant. The principles which should guide him in making this distribution are particularised later. Loading up is performed from the side of the carriage, the berths on the side next the platform being loaded before those on the further side, and upper berths before lower. To facilitate this process, it is recommended that the eight patients allotted to each carriage should be set down before that carriage in a single row, as follows: The two centre stretchers of the eight will contain those patients who are destined for the upper berths on the near side; the second stretchers counting outwards in each direction, those for the lower berths on the near side; next to these, those for the upper berths on the far side, and last of all those for the lower berths on the far side. The two ends of a carriage may, with well-practised squads, be loaded simultaneously. In carrying out the selection of patients for different carriages, the following points should be kept in mind:—

1. Is the disability external or internal?
2. Does the patient require much or little attention?
3. Is isolation necessary or not?
4. Is it important that the patient should be kept as quiet as possible?

5. Is there much or little discharge ?
6. Is the patient a smoker or non-smoker ?
7. The rank of the patient.
8. To what extent is the patient likely to suffer from the oscillation and vibration of the train ?
9. The destination of the patient.
10. The personal wishes of the patient.

The points indicated above by the numbers 2, 4, 6, 7 and 8, are the most important; cases that cannot bear shaking should never be in the rearmost carriage. Cron gives the following scheme as an instance of the working of the above principles; the serial number indicates the order of the carriage in the train, beginning behind the goods van :—

1. All cases needing isolation, placed here so that the attendants need not pass through on their way to other cases.
- 2, 3, 4 and 5. All cases going to Evacuation Station B, with the exception of isolation cases, and such cases as need constant attention. Cases which it is advisable should be disturbed as little as possible in No. 2, as here they are less likely to be disturbed by attendants passing through. 3, 4 and 5 to be divided into smoking and non-smoking carriages, internal and external ailments to be as far as possible kept apart.
6. Carriage for cadets, one year's volunteers, etc.; these should always be near the medical officers' carriage.
7. Medical officers' carriage.
- 8 & 9. Store and kitchen waggons.
10. Subordinate establishment.
11. Cases needing constant attention; these should always be near medical officers' carriage; smoking should be forbidden, and regard need not be had to the destination of the patients.
- 12, 13, 14, 15 & 16. All cases going to Evacuation Station A, with the exception of cases needing constant attention or isolation. Cases which it is advisable should be disturbed as little as possible to be put in No. 15; they will here be less troubled by passers through than in 12, 13 and 14, and less likely to suffer from the oscillations of the train than in No. 16. The other four carriages to be divided between smokers and non-smokers, according as their ailments are external or internal.
17. Patients not likely to suffer from the oscillations of the train.

In selecting cases for different berths, the worst cases should be put in the upper berths, as being more accessible; the wounded side should be placed towards the centre of the carriage for the same reason; and lastly, the wishes of the patient should be considered if possible. All manœuvres connected with the loading and unloading of trains should

be practised as repeatedly as possible. The difference between practised and unpractised squads may be equivalent to the difference between a few minutes and as many hours; 20 minutes may be looked on as a good average time for the actual entraining.

In the Italian Service, as already stated, the train stretchers may be sent for the wounded, if the hospital be close at hand; otherwise, they will be brought to the station on requisitioned carriage. In either case, the stretchers, when loaded, will be placed in two groups; in the one those whose injuries are most accessible from the right, and in the other those whose injuries are most accessible from the left; the two groups are equalised by the allotment of those patients whose position is a matter of indifference. The stretchers are then carried to the train and arranged in two ranks, the group first named above in the front rank, with one pace interval between stretchers. The loading party is then told off in squads of six, with, in addition, a superintendent of the first class and one of the second class to each squad; three men and one superintendent then take post on the station platform, the others on the platform of the carriage. The half-squad on the station platform take up a stretcher and carry it to the carriage platform, and pass it to the other half-squad; the other half carry it into the carriage and deposit it in its right place on the brackets. Loading is carried out, beginning at the right of the door of entrance and working round to the left, the lower stretcher of each pair being deposited before the upper. In case of the carriage not being provided with removable platform rails, the train must be broken up into groups of two carriages, with a space of about six yards between groups. Squads of three men and one superintendent will then be formed, and these will then each take entire charge of a stretcher throughout the manœuvres, and, after depositing it in its proper place in the carriage, will proceed along the corridor and leave the carriage by the door at the further end of the group. In the first case each squad will have 50, in the latter 25, patients to entrain.

In the German Service, the commandant of the train receives from the Sick-Transport Committee written instructions on all important points connected with the journey—*e.g.*, times of stopping and starting, long halts, rest and refreshment stations, etc., the line of railway in the home territory to which the train is bound, or its destination, so far as it has been communicated to the committee. When all the sick and wounded have been entrained, the commandant will go round to every carriage and satisfy himself that everything is correct as regards the loading up of the patients, the telling off of the attendants to the various sick-carriages, etc. He will then report to the committee, and to the commandant of the railway station, that the train is ready for starting. No instructions are given in the *Kriegs-Sanitäts-Ordnung* as regards the pace at which the train will be run, or what means should be used for stopping the train when in motion. At every stop the commandant will report himself to the commandant of the railway station, and ask for orders; should such orders not be in agreement with those previously received from the Sick Transport Committee, or not, in his opinion,

compatible with the interests of the patients in the train, it is his duty to obtain a written copy of them, if the commandant of the station insist upon their execution.

The instructions given in the French Regulations are rather meagre, and merely state that telegraphic notice should be sent in advance along the line whenever a train starts, to inform the authorities at stopping stations of strength of party, time of arrival, etc. On purely military lines, the pace of these trains will not exceed that of ordinary military trains. On lines where peace conditions still prevail, this pace may be increased up to a limit of about 25 miles per hour. There are no special directions given for stopping the train when in motion.

The Austrian regulations lay down that the commandant of the train should (if possible, 24 hours before the departure of the train) fix, in consultation with the railway station commandant, the various details of the journey—*e.g.*, the routes to be followed and the stopping stations; advise station commandants of those places where long stops will be made; arrange general preparations for entraining, and fix the hour of the same; and, finally, obtain all the information he can as to the route he is to follow. After entraining is completed, the carriage orderlies report all correct to the N.C.O. of the train (*Zug-inspection*), who, in turn, reports to the commandant. This latter officer then takes a look round the train, and reports to the station commandant that the train is ready to start. The rate of travelling is laid down at 12 to 15 miles per hour, which is not to be exceeded except under special circumstances. In hostile or disturbed territory, the train will, as a rule, halt for the night in some convenient empty siding.

(This last order is noteworthy, as it is not contained in the regulations of any other Service. If a necessary order, it would seem to point to the inadvisability of using permanent Hospital Trains near the front at all, as their great advantage—*viz.*, being able to travel uninterruptedly—is thus thrown away.)

To stop the train in motion, signal flags by day and hand lanterns by night are to be waved outside the window, but this expedient must only be resorted to in cases of great necessity, as, for instance, fire or other accident, or to permit of the carrying out of some emergent treatment which demands absolute freedom from vibration, such as the ligature of a vessel. To avoid mistakes it is laid down that cloths and rags are not to be thrown out or shaken out of a window whilst a train is in motion. An excellent graphic time-table (*Marschplan*) is given to the commandant, in which are given the names of stations where stops will be made, the duration of the same, and the time at which they will occur. The length of a journey is indicated by a thick line along which the names of the stations are written at suitable intervals; thin transverse lines denote the change from one system to another, and the portion traversed between midnight and midnight is enclosed between thick transverse lines.

In the Italian Service, permanent Hospital Trains run in accordance with the time-table laid down for military traffic generally, or with the

ordinary time-table, whichever happens to be in force on the portion of line traversed; the route followed is laid down by the intendant. No directions are laid down in the "*Regolamento pel. Trasporto sulle Ferrovie, del Feriti e Malati in Guerra*" as regards the pace of the train or the measures to be taken to stop it in the case of accident or other emergency.

The keynote of the work in a permanent Hospital Train is its continuity. This applies to trains of this class in all Services, and serves to distinguish them from the next class of improvised Hospital Trains. The French regulations lay down that these trains "constitute veritable rolling hospitals, and are administered as such." True though this is, to a certain extent, no doubt, yet there is some exaggeration in the statement, which is recognised by such leading authorities as Cron and Zur Nieden, who point out that such a train lacks one of the leading characteristics of a hospital, in that, owing to the necessarily short stay of the patient, and the limited space available, no independent line of treatment can be initiated in it, nor can any elaborate operation be performed. Thus the medical officer of the train must be reduced to a pure conservatism, and to carrying on or developing, on lines already laid down by others, the treatment of the patients under his care, and may consider his duties fulfilled if he hand over his cases at least no worse than when he took them over. This may seem rather a pessimistic view of the position, but it is one held by men of experience, and there is indubitably an advantage in expecting as little while trying to get as much as possible out of the system.

The following points may be particularly touched on :—

The Germans allot one hospital assistant and one nursing orderly to every pair of sick carriages; each of these wears a metal label in the button-hole of his coat, the former having the odd, and the latter the even, number of the pair of carriages stamped on his label; one of these two men must always be on duty in this pair of carriages.

The French lay down no particular directions. The regulations do not provide for more than one attendant per carriage, with about four in reserve.

The Austrians are better provided in this respect, as 13 attendants travel in the sick carriages, leaving (after deduction of cooks and dispensary assistant) a balance of 9 men in reserve, in addition to 3 officers' servants, who may also, if necessary, be utilised.

The Italians, with their greatest number of carriages (18), can leave a reserve of 6 nursing orderlies and four officers' servants. No definite directions, however, are laid down.

In the German Service the commandant decides in which carriage a night watch shall be kept; in this a bed is made up either on the floor of the corridor or in a spare berth, for the attendant detailed for this duty.

A practically similar arrangement obtains throughout all Services, and as a matter of fact a portion of the establishment must, owing to want of accommodation elsewhere, sleep in the sick-carriages. Cron

points out the advisability of keeping night-duties as low as possible, in consideration of the inevitably great stress of work during the day.

(Such a matter must in effect be left to the discretion of the S. M. O., and probably would be best solved by posting an attendant in each carriage indifferently; it is difficult to see any other satisfactory solution of this problem, except putting on a certain number of men as a night patrol. Obviously a sleeping attendant in the next carriage is not of much use to a helpless patient.)

The general idea is that the work of a train should be assimilated as nearly as possible to that of a field hospital, regular visits being made, drugs being dispensed in the train, and so on. Cron emphasises the necessity of having the establishment thoroughly drilled in their duties during the journey of the train empty, to the front, and having a timetable (of which he gives a very excellent specimen) made out, in which every day and every hour should have its appropriate duty. The greatest cleanliness is enjoined in all Services; all stools should be disinfected, immediately on being passed, by means of disinfectant solutions placed in the bed-pans and commodes. In the French carriage a trap-door exists, through which the contents can be emptied. In the Austrian regulations it is laid down that bed-pans are only to be used when absolutely necessary, and their contents are to be emptied from the bridge, between two carriages, and not from the windows. Immediately after being emptied they must be filled with 5 per cent. carbolic lotion. In the Austrian and French trains tubs of disinfectant are placed in the leading luggage van, in which all soiled linen should be placed at once or during the first halt; the same regulations advise that all soiled dressings should be at the same time taken to and burnt in the furnace of the engine, being kept till then covered with disinfectant in some convenient receptacle.

Ventilation must be carefully attended to, which, as Cron points out, may be difficult to reconcile in cold weather with the proper warming of the carriage. He gives 50 Fahr. as the lowest temperature which should be allowed. In warm weather the carriage may be freely opened; when this is impossible or inadvisable, every means must be taken to keep the air in the carriages as fresh as possible; smoking may if necessary be completely stopped, pipes and tobacco being confiscated, if mere prohibition be insufficient. The cubic space allowed per man in the Austrian sick carriage is only 150 cubic feet; the regulations of other nations give no information on this point.

Patients in permanent Hospital Trains are always dieted in the train, on ordinary Field Hospital scales as a rule. The establishment is also dieted on the train whilst travelling; during protracted halts they may be rationed by the commissariat of the locality. The Italian gives only two meals per diem, the other trains three.

In the German trains one of the assistant surgeons is told off specially for dispensing, with a hospital assistant to aid him; in other Services special officials are attached to the train for this duty. The German regulations enjoy simplicity in prescriptions.

The manœuvre of detraining is the reverse of that of entraining ; the French method is, however, somewhat simpler, the stretcher not being deposited and lifted again so often.

In all cases the responsibility of the medical officer of the train ceases when the patient leaves the train, the authorities of the receiving hospital being responsible for all subsequent arrangements. His duties in this respect, therefore, are limited to the purely professional handing over of his patients and their documents. It is generally enjoined that patients should only be transferred *en route* when it is quite impossible to carry them any further ; in such a case they may be left at any suitable hospital *en route*, previous notice being, if possible, given.

Should a patient die in the train, the corpse must be handed over to the first military or civil authorities that are met with, notice being, if possible, sent in advance. The Italian train is the only one which provides a special partially fitted-up carriage which can be used as a mortuary or isolation carriage, as the case may be. Wasserfuhr considers that it should be always possible to avoid this contingency by timely evacuation, and Myrdacz states that only one death occurred in a train in motion during the war of 1878-9 in Bosnia. (There were four hospital trains, which carried in all 6,431 sick and wounded during this war.)

In the German Army the following transfer documents accompany the party :—

1. Transfer Roll (*Namensverzeichnis*).—A simple nominal roll, giving the information usually given in an admission and discharge book. This roll is signed by the receiving medical officer at the end of the journey, as a voucher. Deaths *en route*, transfers to hospitals other than that at the termination of the journey, are entered in a remarks column.

2. Way-Bill (*Begleitschein*).—A form handed over partially filled up by the sick transport committee to the medical officer in charge of the train on his taking over the party. The first page consists of four parts.

The first part contains a numerical state of the number of men entrained, with the following particulars, date, and place of entraining ; the number of men is classified as :—

a. Germans and allies ;

b. Prisoners, and

Total

each of these classes being again divided into sick and wounded.

The second part of this page is a similar state, similarly divided, showing the discharges from the train.

The third part is a column for the signatures of the medical officers taking over cases from the train, and the fourth is a column for remarks.

The first part is filled up by the sick transport committee (or other authority handing over cases for the train), the second and fourth by the medical officer in charge of the train, and the third by the medical officers or other authorities taking over cases from the train.

The second page contains the strength of the escort, if any (this practically only applies to ordinary trains), and the strength of the nursing establishment, and statements of the amount of extra equipment



taken and handed over with the party or with individual patients. These last particulars do not as a rule, however, concern permanent Hospital Trains.

In the French Service a transfer roll (*feuille d'évacuation*) is made out for every party; it contains the following information, in addition to the names of the men, viz., the order authorising the movement, the destination of the party, the medical establishment accompanying it, and any changes occurring *en route*. This roll is handed over to the *officier d'administration* of the train, together with the small books and hospital tickets (*livrets individuels, billets d'hôpital*) of the patients. It is eventually signed by the medical officer of the receiving hospital at the end of the journey, and returned to the medical officer of the despatching hospital as a voucher.

In the Austrian Army patients are taken over with the following documents:—

- a. A nominal roll or rolls, acting as last rationing certificates.
- b. A single nominal roll for the whole party, acting as a transfer roll.
- c. Identification papers (*Legitimations-blätter*). These papers are handed over with the party at the end of the journey.

In the Italian Army the S.M.O. of the despatching hospital takes out the following documents:—

For each patient a clinical chart (*cartella clinica*), or otherwise a diagnosis label (*tabellina diagnostica*).

For the entire party a transfer roll in duplicate (*Foglio di traslocazione*). This roll is used by the medical officer in charge of the train to check the party when taking over, and is subsequently handed over by him, after making any remarks he may think fit, to the medical officer in charge of the receiving hospital, together with the clinical charts. One copy is signed by the medical officer of the receiving hospital, and is returned as a voucher to the despatching hospital. In case of the death or transfer of a patient *en route* a descriptive roll (*foglio di consegna*) is handed over with the corpse or patient, and an explanatory note entered in the original *foglio di traslocazione*.

In the German Service the disinfection of trains is left to the discretion of the medical officer in charge, who will, should he think proper, recommend in writing to the commandant of the railway station the performance of the process, mentioning at the same time the process to be employed. For carriages without special fittings (this, in effect, applies more to the trains of the other two classes) it is recommended that the floor and inside of the carriage generally should be swept out and swabbed, and then exposed to the action of steam at 212 F., or of water at 160 F.; a hot 5 per cent. solution of caustic potash, or soda, is recommended for swabbing out with; chloride of lime may be used in the same way.

The French make no mention in their regulations of this question as regards permanent Hospital Trains.

In the Austrian Service, it is laid down that every train should

be disinfected immediately after use either at the discharging or nearest convenient station; it is carried out by the train establishment. The following measures are prescribed:—All removable articles that will stand washing should be soaked for 24 hours in a 2 per cent. solution of carbolic acid. The floors and walls, and wooden and metal fixtures, and leather straps, should be scrubbed first with boiling water, and then with soft soap containing 2 per cent. carbolic acid, then swabbed with wet cloths, and lastly rubbed with a dry cloth. Commodes and bed pans should be cleaned with chloride of lime. All silk and woollen material must be sprinkled once a day, for three days, with a 2 per cent. solution of carbolic acid; if much stained or soiled they should be removed and steamed or burnt. After disinfection the carriages should be allowed to stand open for 48 hours in a free current of air.

In the Italian Service the ordinary cleansing of the inside of the train is performed by the establishment of the train; that of the outside and the disinfection of the inside, should this be necessary, by the railway station staff. After an ordinary journey, in which only non-infectious diseases or injuries have been carried, a simple scrubbing and sweeping will be sufficient; this may be done with hot water only, or, as when cattle trucks have to be adapted as sick carriages (this applies mostly to improvised Hospital Trains, *q.v.*), with 5 per cent. solution of carbonate of soda, quicklime, etc. All parts of the floor or the canvas of stretchers, which have been soiled with blood or other discharges, should be repeatedly cleaned with the following solution:—Corrosive sublimate 3 parts, hydrochloric acid or common salt 5 parts, water 1,000 parts. Soiled linen should, till it can be washed, be kept immersed in a similar solution. Mattresses, pillows, etc., which have been soiled should be returned to the society's stores. All carriages which have been used for infectious cases, or which have made several journeys (six or eight) with ordinary cases, should, in addition to the above precautions, be fumigated. To effect this, a portable charcoal brazier should be placed on the floor of the carriage, care being taken to strew a sufficient amount of earth beneath it to avoid all danger of fire; sulphur should be burnt on this in the proportion of 25 grammes per cubic metre (about 11 grains per cubic foot) of the internal capacity of the carriage. The carriage should be kept closed for two hours; it should then be thoroughly aired, and washed again with perchloride of mercury solution. Such minor articles as do not appear to have been thoroughly disinfected may be burnt.

#### IMPROVISED HOSPITAL TRAINS.

The second class of trains used for the transport of sick and wounded consists of improvised Hospital Trains. German, *Hülfslazarethzüge*; French, *Trains Sanitaires Improvisés*; Austrian, *Kranken-Züge*; Italian, *Treni Attrezati e Improvvisori trasporto Feriti e Malati*. These trains differ from permanent Hospital Trains, in that whereas the latter are organised units, the former are merely aggregates of carriages got together for the moment, established and equipped in a merely temporary manner, and

have, in the majority of cases, no fixed size or arrangement. In addition they do not possess any means of through communication from carriage to carriage, nor is there any kitchen carriage provided. They are intended as stated in the French regulations (the rule is, however, universally true), for the transport of such sick and wounded as need lying down accommodation, but whose condition is not such as to demand constant medical attention.

In the German Army, there is no definite formation laid down for these trains, but a maximum of 80 axles is given as a guide.

The French train consists, as a rule, of 40 waggons, arranged as follows :—

1. Brake van for equipment and baggage.
- 2 to 11. Carriages for sick.
- 12 and 13. Brake vans.
- 14 to 19. Carriages for sick.
20. Carriage for establishment, with one compartment available for four sick sitting up.
- 21 to 27. Carriages for sick.
- 28 and 29. Brake vans.
- 30 to 39. Carriages for sick.
40. Brake van.

The Austrians have no fixed rules for these points.

The Italians have two classes of improvised Hospital Trains, viz. : *Treni Attrezati* and *Treni Provvisori*. The former have a definite size and formation, and are composed of 38 carriages arranged in the following order :—

1. Baggage waggon.
- 2 to 19. Carriages for sick.
20. Carriage for medical establishment.
21. Store waggon.

*Treni Provvisori* have no definite size or arrangement.

In the German trains, red crosses on a white ground, 20 inches square, made of cloth, are fastened on the right and left side of carriages alternately; the train has a special number, and all the carriages are also numbered. At the end of a journey, these crosses must be removed from all carriages not intended for the carriage of medical store to the front.

In the French trains the first and last carriages of the train fly the Red Cross and national flags, and every carriage bears on one side or other, a red cross on a white ground, made either of metal or cloth. Every carriage is marked with a number, and the use to which it is put is also written on it.

The Austrian regulations do not apparently lay down any directions in this matter.

The Italian *Treni Attrezati* carry the same distinctive marks as the permanent Hospital Trains of the same Service. The *Treni Provvisori* carry only the Red Cross and national flags, and the lanterns of neutrality.

In the German Service any baggage waggon, or 4th Class passenger waggon, without permanent seats or other fixtures likely to interfere with the entraining of the sick, may be used. Such waggons are to be preferred which have windows or ventilation openings in the side walls or doors; where these do not exist, openings should be cut out in the doors, and covered with some light transparent material.

Two systems are used for the suspension of stretchers, the Hamburg system and Grund's system. In the Hamburg system the stretchers are hung from the roof by an apparatus consisting of:—

1. An automatic clamp (*griffe au diable*), which grips the roof beam of the waggon.
2. A coiled spring attached to the clamp.
3. A chain hanging from the case of the spring.
4. An iron bar hanging vertically from the chain. At each end of this bar is a square ring, which serves to hold the handle of a stretcher.

To carry two stretchers, one above the other, four of the above arrangements are necessary; the height of the stretchers from the floor may be regulated by taking up or letting out links of the chains. The feet of the lower stretcher should not be more than 3 inches from the ground, and the vertical distance between the stretchers is a little short of 3 feet. The distance between the ends of the stretcher handles, and the end walls of the waggon should be about 6 inches. Lateral movements are prevented by steel spring rings, fastened to the stretcher handles, and to hooks on the side walls of the waggons. There is no arrangement for holding stretchers down except their own weight and that of the patients. Eight stretchers may be carried in each waggon on this system. Grund's system consists of strong arched springs, joined by stout traverses, running from the crest of the arch of one spring to that of another. Two springs thus joined are placed at each extremity of the waggon, and two more at somewhat less than a stretcher length from each of these. Each waggon, therefore, contains eight stretcher springs and four traverses, so arranged that the traverses run at right angles to the long axis of the waggon; stretchers are now laid upon these traverses, three at each end of the waggon. Each stretcher comes into relation with two traverses and four springs. Each spring terminates at one end in a shoe, which is strongly bolted to the floor of the waggon, and at the other in a pair of rollers, which permit of a certain amount of movement of the spring; from the crest of the arch of the spring two plates of metal project vertically, forming a slot in which the end of a traverse is placed. By both the Hamburg and Grund's systems the centre of the waggon is left free for attendants, necessary articles of equipment, and in the cold weather a stove. The French use covered baggage waggons, preferably those which possess means of ventilation, and are in good repair; brake vans should not be used, as the jar of the brake is bad for the patients. The systems of suspension used are two:—

1. The *Appareil à deux étages, modèle 1874-80, système Bry-Ameline*, and

2. The *Appareil à trois étages, modèle 1891, système Bechot-Desprez-Ameline.*

In the *Appareil à deux étages*, the stretchers are supported in two tiers on traverses, each pair of traverses supporting three stretchers, as in Grund's system.

The traverses are not, however, supported from below, but slung by spring-hooks from iron plates, which are firmly bolted to the side walls of the waggon; the ends of the traverses which support the head ends of the stretchers are allowed free vertical movement in a groove in the iron plate, the others are not confined in any way. The stretcher handles are fastened to the head end traverses only, by leather loops, six in number on each such traverse.

The *Appareil à trois étages* consists of an iron framework or cage, rectangular in shape, inside of which three stretchers are slung. The component parts of this framework are as follows:—

1. Two end pieces; these consist each of two strong uprights, joined together by three rather slight traverses (*entretoises*); these traverses are not straight, but slightly bent at either end in a vertical plane. These end pieces are joined at top and bottom by
2. Four stout iron rods (*traverses d'assemblage*), which complete the framework. The ends of these rods pass through holes in the uprights, and nuts are screwed on to the projecting portions to fix them.

To each upright are fastened three spring hooks, each at a definite distance above one of the *entretoises*. From each spring hook on any upright to the corresponding hook on the other upright, at the same end of the framework, passes a swinging traverse (*traverse porte-brancard*) on which the stretcher rests. Every stretcher thus rests on two swinging traverses and four spring hooks. The swinging traverses hang at slightly higher level than the corresponding fixed traverses. The *Appareil à trois étages* measures when put up 6 feet in height, 6 feet in length, and 3 feet in breadth. It is packed for carriage in two portions.—*a.* The two end pieces, with fixed and swinging traverses complete, are placed together, the head of one in contact with the feet of the other, and the outer aspects touching; they are kept secure by lashings of wire or pack-thread. Each swinging traverse is similarly lashed to its corresponding fixed traverse to prevent damage. *b.* The four *traverses d'assemblage* are kept in one package by means of two short boards, in which holes are made; through these the ends of the traverses are passed and there fixed by the nuts used for fixing them to the uprights of the framework. The total space occupied by this *Appareil*, when packed, is about 10·75 cubic feet; its weight is 127 lbs.

Three men are necessary for the manœuvre of putting the framework together; this, including unpacking and placing ready for use in a waggon, is calculated to take 15 minutes. Four frameworks can be placed in each waggon, the long axes of the frameworks being parallel to the

direction of the train. A fifth may exceptionally be placed in the centre of the waggon across it. (This could only be justifiable under conditions of extraordinary pressure, and for short distances. It would completely prevent any attention being paid to the sick, and would reduce the cubic space per patient to 70 cubic feet.)

The Austrians and Italians use the Swiss system. The apparatus consists of eight uprights of pine wood 6 feet 9 inches in height, 5 feet 5 inches in breadth, and 1 inch thick. Four uprights are placed on each side of the waggon and bolted to the wall, with which they do not, however, come into actual contact, the bolts passing through blocks of wood between the uprights and the walls. Except at these points, then, there is a space left between the uprights and the walls of the waggon. Holes are drilled in each upright at a height of 3 feet, and 5 feet 8 inches from the ground. Through these stout hooks are passed. These hooks are made of iron, and the shanks are bent at right angles in a vertical direction, so that that portion of the hook that projects on the further side of the upright is closely applied to the outer surface of the latter; the greater the downward pull the more strongly will this vertical piece of the shank press against the upright. The extremity of the shank has a short stout spur, which presses into the wood of the upright and assists to fix it. From these hooks the stretchers are slung by means of webbing or hempen-plait slings. These are 2 feet 5 inches long, and are doubled over so as to have a long and a short end. At the point at which it is doubled over the sling passes through a triangular metal ring, to which it is securely fastened; the free ends are doubled back and stitched to form loops. The triangular ring is now hitched on to a hook on an upright, the long end of the sling being towards the centre of the waggon. This long end now receives the outer handle of a stretcher, the short end the inner handle. Each stretcher thus depends on two hooks and two uprights. If it is required to sling three stretchers one above the other, three holes for hooks are bored in the uprights, at distances of 2 feet 2 inches, 4 feet 3 inches, and 6 feet 3 inches from the ground. The same slings are used, the short ends supporting the outer handles of the stretchers, the long ends being looped round the handles on the inner side in such a manner as to equalise matters and keep the stretcher level. In this arrangement the lowest stretcher will hang at a distance of about 4 inches from the floor of the waggon. The arrangement in two tiers is, however, that more usually adopted, and allows of eight patients being carried in each waggon. In fixing the uprights, the minimum distance from an upright to an end wall must be 8 inches; from one upright to the next on the same side, 6 feet.

It may be of advantage to shortly compare the above systems, in respect of the various disadvantages, or otherwise, of each.

1. *The necessity of making more or less elaborate changes in carriages.*—This applies to the Italian and Bry-Ameline systems more particularly; in a less degree to that of Grund. The two former demand a considerable amount of carpentering skill.

2. *Dependence on the walls and roof of the carriage.*—The Hamburg system brings a great strain to bear on the roof beams, the Bry-Ameline, and to a less extent the Italian system, on the side walls. Bolts screwed through wood, where the channel is not metal-lined, necessarily become insecure after a time, if exposed to much vibration, with a constant strain acting in the length of the bolt.
3. *The possession of special apparatus.*—This objection applies to all spring-hook apparatus, and is the greater the greater the weight placed on the hook. For instance, the breaking of a spring hook in the Bry-Ameline system would be a much more serious affair than a similar accident occurring in the *Appareil à trois étages*; in the former we would have three stretchers suddenly let down at one end, in the latter only one stretcher would fall at one end and would be at once caught and supported by the fixed traverse below. It may be safely laid down that whenever spring hooks are used a considerable reserve should be carried, and that the possession of a spring hook on which the safety of several stretchers absolutely depends forms an almost fatal objection to any system. The springs of Grund's system are so strong that a similar objection does not apply to them. There is a danger in this case, however, of the springs being too stiff and not working unless loaded up to the maximum weight, which may not always be possible.
4. *Oscillation.*—This applies mostly to the Hamburg system, and next to the Italian. In Sigel's modification of the latter, used in the Austrian Service both for trains and hospital ships, india-rubber fenders are used to obviate the jarring of the stretchers against the side of the carriage or the bulwarks of the ship. Grund's system seems to be most free from this objection.
5. *Over-crowding of Stretchers.*—This applies especially to Grund's and the Bry-Ameline systems. With three stretchers it must be difficult to get at or do anything for the man on the centre stretcher, especially on the lower tier. For instance, the breadth of a luggage van, as shown in the diagrams in the *Kriegs-Sanitäts-Ordnung*, is 7 feet 6 inches; the breadth of the regulation German stretcher is 22 inches; three of these last, therefore, occupy a space of 5 feet 6 inches, leaving for the four interspaces between the outside stretchers and the side wall, and on either side of the middle stretcher, a total residue space of 2 feet. This does not give an attendant more than enough space to stand uncomfortably in, certainly not enough to kneel or stoop in. This objection is stronger in a double-tier system as the Bry-Ameline or Richter's modification of Grund's system.

The *Appareil à trois étages* seems, on the whole, freer from objection than any other. It necessitates no alteration in the carriage, it depends on neither the roof nor the walls, the spring hooks play a less responsible part than in any other spring-hook system, and the danger of any one of them breaking is discounted by the presence of the fixed traverse immediately below. The lateral distance between stretchers is over 18 inches. The *Appareil* is, in addition, of almost universal applicability, whether for use in trains, boats, or country carts. Two improvements may be suggested:—(a) the provision of somewhat broader feet for the uprights; and (b) that the rings on the uprights, to which the spring hooks are fastened, should have a spring opening, so that a broken hook may be rapidly replaced.

In the absence of any of the above forms of apparatus it is generally laid down that use must be made of any available local resources whereby jolting may be diminished. The French suggest the use of palliasses stuffed with straw, the corners being left empty and bound with cord to form handles. If stretchers are used they should never be laid directly on the floor of the waggon, the handles should be supported on faggots, bundles of straw, etc. Palliasses or stretchers should be laid parallel to the long axis of the carriage, three at each end, a seventh being exceptionally placed crosswise in the centre. The Italian regulations give few instructions and apparently allow of stretchers being placed directly on the floor of the waggon, as well as of the use of loose straw. Neither of these methods should ever be used except in extremity. Of the latter, Cron says that it is "very primitive, likely to catch fire, and cruel to the patient." The Italian *Treni Provvisori* are always fixed up in some such way.

In addition to the above official systems, two others, not recognised as such, may be described.

1. The *Zavodovsky* system.—This is official in the British and Russian Services, and is sufficiently well known not to need detailed description. Its chief defect is that great reliance has to be placed on the large iron hooks which form the keystone of the structure. The consequences of one of these "drawing out" or breaking would be extremely serious. In addition, a great strain is thrown on the roof and side-walls of the carriage. Otis, the leading American authority, objects to this system, that the knotting and splicing of the ropes which form the suspension would require the assistance of specially-trained men; he also anticipates the occurrence of considerable oscillation. Rédard, on the other hand, strongly approves of it.
2. The *Rédard-Chevallier* system.—In this system the stretchers are arranged in two or three tiers, and are suspended from the roof and side walls by spring-hooks and iron rods. A great deal of dependance is placed on these somewhat delicate pieces of mechanism, and the strain on the roof



must be considerable. The springs used are of peculiar design, and it is claimed for them by the authors that they are less liable to break than those in ordinary use. Oscillation is prevented by a complicated system of guy-ropes.

The following accommodation is provided by the different improvised systems described :—

Hamburg, 8 sick per carriage.

Grund's, 6 sick per carriage (Richter's modification, not official, 12).

*Appareil à trois étages*, and Bry-Ameline systems, 12.

Austrian and Italian systems, 8, and on emergency, 12.

Zavodovsky system, 8.

*Rédard-Chevallier*, 8 or 12, as desired

It is laid down by Rédard that ordinarily not more than eight or ten patients should be carried in an ordinary van ; this gives about 130 to 100 cubic feet per patient.

In the German Service the following equipment is furnished by the Sick Transport Committee for every improvised Hospital Train :—

For every patient one mattress and blankets as required ; for every waggon one water-can with drinking-cup, one glass or earthenware medicine measure, one standing basin, one lamp, one hand-lantern, and one signal flag.

The committee also supplies such drugs as may be required on the indent of the S.M.O. of the train, and a supply of comforts is also allowed.

In the French Service the following equipment is provided :—

For every patient one cup and one mug of tisane, and bed and body linen as required.

For every waggon, one commode, one bed-pan, one spittoon, one pail of pure water, one pail of tisane, and one camp stool. The medical equipment consists of a medicine chest (called variously "*cantine médicale*" and "*caisse de médicaments*," contents not stated. Medical comforts, a camp kettle and a small stock of fuel are also provided. The Evacuation Hospitals supply the above articles, being specially equipped with a view to this purpose.

The Austrian train is equipped as follows :—One small medicine chest, one small dressing haversack with surgical instruments and various dressing materials, ten each of the following articles, viz. :—drinking-cups, pails for water, bed-pans, urinals, lanterns with candles. For every waggon, one camp stool, one hand-basin, and, if possible and necessary, a stove.

The Italian *Treno Attrezato* has a very complete medical and surgical equipment, contained in two boxes, with two boxes of medical comforts and cooking utensils. One lantern is allowed per carriage. In the *Treni Provvisori* we only find a medicine chest (*cassa da medicazione*) per train, other equipment depending on the possibilities of the case. In both the Italian and Austrian trains the dispatching hospital provides all necessary bedding.

The extent of the establishment is decided in the case of German trains by the exigencies and possibilities of the moment. One or two medical officers, two hospital assistants, and 12 to 15 nursing orderlies, per 100 patients are the rule. These are supplied by the Sick Transport Committee.

The French allow one *médecin aide-major*, one *pharmacien aide-major*, one *officier d'administration*, and 45 *infirmiers* to every train of 38 carriages. This establishment is furnished by the Evacuation Hospital.

In the Austrian train a military medical officer is, if available, sent with the train; in default a civilian practitioner is employed, a combatant officer being sent in this case to act as commandant of the train. In addition three under-officers per train, and one nursing-orderly to every carriage containing serious cases, or to every two containing slight cases, are allowed.

The Italians have a definite establishment for every *Treno Attrezzato*, viz., 4 medical officers, 2 under-officers, 5 N.C.O.'s, and 35 privates, with 4 officer's servants. The medical officers are taken from the reserve of officers and the territorial militia, the remainder of the establishment from the militia. They are detailed for duty by P.M.O. of the Army and sent to the front as required. In the case of *Treni Provvisori* all the above class of men are represented, and care should be taken that the following minimum establishment is provided, viz., one medical officer and one N.C.O. to each train, and one sick attendant to each carriage. These are furnished locally when the trains are made up.

In the German Service improvised Hospital Trains are made up by the Committees for Transport of sick and wounded, under the orders of the Inspector-General of Railways and Communications, on requisition by the committee through the P.M.O. of the field force. The necessary rolling stock is detailed by the Chief of Field Railways. In the French Service the P.M.O. of Communications, acting on the information contained in the daily reports from the Evacuation Hospitals, recommends to the Directors of Communications the formation of the necessary improvised trains. The necessary rolling stock is then handed over to the medical officer in charge of the Evacuation Hospital, or to the delegate of the aid society, who fit out the train with the aid of the establishment told off for the train. The local railway authorities are enjoined to render every assistance. It is calculated that working with six squads of six men each, two squads being told off to each section of the train, four hours should be sufficient to fit out a train of 33 carriages, including unpacking the apparatus, affixing the badges of neutrality, etc. Using the *Appareil à trois étages*, rather less time should suffice.

In the Austrian Service the G.O.C. gives all the necessary orders for the formation of these trains, on the recommendation of the P.M.O.

In the Italian Service the procedure is the same as in the case of permanent Hospital Trains, the intendant deciding which class of train shall be used in any particular case. The necessary stores may be collected at one station or distributed along the line at the various stations

in the vicinity of the hospitals which have to be evacuated. The P.M.O. informs telegraphically the medical officers of the various hospitals of the formation of the train, acquainting them with the accommodation allotted to each, and also with the timing of the train. The Italian train differs from those of the other Services in that whereas the latter are formed at the front, to take back men to the rear, the former are formed at the rear and sent forward to fetch men back from the front. The *Treni Provvisori* are, however, made up at the front, as in the case of the other Services.

In the German Service no special directions are laid down for the reception and entraining of patients; presumably those given for permanent trains would, *mutatis mutandis*, be followed.

In the French Service it is recommended that the S.M.O. of the train should arrange for a sheltered platform or siding for this purpose, using waiting or other rooms for the assembling of the patients. Such patients as are able to walk should be assisted to their carriages by the *infirmiers*, and placed on their stretchers; the remainder are carried by four men to the train on stretchers. In loading with the Bry-Ameline apparatus the following manœuvres are necessary: four men take post in the waggon as follows:—No. 1 between a head-end traverse and the end-wall of the waggon, No. 2 between the traverses, Nos. 3 and 4 opposite the door of entrance. The stretcher is passed in by the four men who have brought it to the train, and taken charge of by Nos. 3 and 4, and by them deposited on the floor of and across the carriage. It is then lifted up and the head-end passed across the traverse to No. 2, and by him to No. 1. No. 1, and No. 3, who still retains hold of the foot-end of the stretcher, now carefully lower it on to the traverses in its correct position, the former fastening the head-end by means of the straps on the traverse. The outer stretchers at one side are fixed on first, then those at the other side, lastly those in the centre of the pair of traverses, those on the lower tier being fixed before those on the upper tier, in each case. The comparatively small space between the stretchers must make the manœuvre of loading up the centre stretcher of the upper tier a difficult one. In the case of the *Appareil à trois étages* four men take post at the door of the waggon and receive the stretcher as it is passed in to them, and proceed to load it on to the swinging traverses, passing it either through the end of the framework, or obliquely from the side. Care must be taken not to strike it against the fixed traverses in so doing. The feet of the stretcher should be outside the swinging traverse, and the latter should press against the inner surface of the feet. By these means the spring hooks are all, to a certain extent, stretched toward the centre of the *Appareil*. Cases needing attention *en route* should be placed towards the centre of the train. To facilitate feeding arrangements such men as are able to get up to their meals should be kept as far as possible in the same carriages, those who must remain lying down being similarly collected together.

The Austrians advise that a covered platform should, if possible, be chosen, and kept clear of all other traffic. The worst cases should be

loaded up first and placed in the centre of the train; as regards the other cases, those who require lying down accommodation should be separate from those who can sit up, and men going to the same evacuation station should be kept together. There are no special instructions given as regards the actual manœuvre of entraining.

The Italian regulations are very complete on this point. The patients on arrival at the station are arranged in two rows, in groups of eight, or twelve, according as it is intended to load, in two or three tiers. The train privates are then told off in squads of six men each, an old soldier and a N.C.O. being added to each squad. The N.C.O. and three men take post on the platform, the others in the waggon; the former pass a stretcher to the latter, who sling it, taking care not to leave hold of the stretcher handles till they are securely engaged in the sling-loops. Upper tiers are loaded before lower, the stretchers to the right of the waggon door before those on the left, the near side before the far side. The packs of the patients are arranged on the floor of the waggon, close to the end wall and between the stretchers, either in one long row, or in pairs. The rifles are laid close along the end wall and parallel to it, the butts in the corner and the barrels resting on the packs. Each man's bread-bag and water-bottle are hung on a hook near the head of his stretcher.

The general rules for starting and running the train are throughout the four Services, *mutatis mutandis*, the same as for permanent Hospital Trains. The medical officer must take care that all the carriages are provided with the proper utensils, drinking water, etc. In the French Service he is enjoined to see that the tub provided for the soiled linen in the rearmost van is filled with disinfectant. All improvised Hospital Trains stop for the night at a rest station, the general rule being that all such patients as can get up and about are detained for the night, helpless cases being left in the train. The pace of the French train is laid down at 15 to 19 miles an hour; that of the others is not stated, but is presumably the same as that of the ordinary military trains, which, on the Continent, is as a rule somewhat slower than this.

The professional work *en route* obviously cannot be of a continuous nature. Medical officers are enjoined to look round the train at every stop, seeing that the patients have all they want, noting how they bear the journey, and arranging that such as cannot bear further travelling are left behind.

The French direct that the shutters of the windows should be left open, and fire-proof gauze, or perforated metal, nailed over them, to prevent smoke or sparks entering; the Germans make a similar direction, but omit the important proviso that the material used should be fire-proof.

In the German and Austrian trains stoves are, when available and necessary, provided. In the French trains hot-water tins are supplied; one in each corner of the waggon is considered sufficient as a rule, but when necessary one should be placed near each stretcher, cases complaining much of cold being given hot-water bottles as well. All cracks

in the walls should be tamped with paper, tow, straw, or other materials especially in the end of the carriage towards the engine.

In the German Army special rest and refreshment stations are established along the line of rail for the purpose of dieting passengers by all Hospital Trains, other than permanent Hospital Trains. This is done under the orders of the communications authorities, in consultation with the railway staff. The station commandant tells off the necessary buildings. He is also responsible for the provision of the necessary number of attendants to carry the food to the carriages. Notice is sent in advance to all stations of the strength of the party and its probable time of arrival; notice of any delay occurring *en route* must also be sent.

In the French Service Railway Station Hospitals are provided at all important stations and junctions (*Infirmieries de gare*). Their duties are:—

1. To provide nourishment for all sick and wounded passing through.
2. To afford emergent aid and to take over temporarily such cases as have been so far aggravated by the journey as to be unable to proceed.
3. To provide, with the assistance of the local military authorities, accommodation for sick and wounded during long halts.
4. To assist when necessary in the evacuation of cases from neighbouring hospitals.

Not being intended to afford more than temporary shelter for the sick they should be installed in the vicinity of properly-equipped hospitals to which they should transfer all such cases as are unable to proceed in the trains.

They are, as a rule, worked by the aid societies; the establishment varies with circumstances, but the following is a fair average: two medical officers, one accountant, and fifteen *infirmiers*. Additional establishment may be procured by the P.M.O. of Communications. These hospitals are established in any available railway buildings, or in tents or huts.

Each hospital should comprise:—

1. An office for the medical officer.
2. A waiting-room for sick.
3. A ward for serious cases, containing five or six beds in ordinary stations; ten or fifteen in stations which act as centres of distribution (*points de répartition*).
4. A soup kitchen.
5. A refreshment-room.

In the wards 700 cubic feet per man should be allowed. The refreshment-room may be worked under contract with the station buffet, or directly by the hospital. In order that food may be rapidly distributed to the carriages, every such hospital should be provided with the following articles, viz., 33 hampers of sufficient size to carry food for 13 men each (12 patients and one *infirmier*).

Thirty-three cans sufficiently large to hold each 13 rations of wine at least, that is 3·5 litres (equivalent to about 6 pints and 2 ounces).

These hampers and cans should be filled in advance, in accordance with the number of cases not able to get out of the train, which will have been notified by telegram. As soon as the train is signalled the station *infirmiers* place cans and hampers at equal distances along the platform, and as soon as the train stops place them in the waggons, the *infirmier* in the carriage distributing the food to the patients. One hour after the arrival of the train the *infirmiers* in the carriage should place on the platform all the hampers, cans, and other utensils. The station *infirmiers* then collect and remove them. The *officier d'administration* of the train gives a voucher for the number of men dieted to the accountant of the hospital, this being countersigned by the S.M.O. During the halt the *infirmiers* of the hospital remove all such cases as are unable to proceed, and take them to the ward of the hospital. Halts on these occasions should not exceed 1 hour 40 minutes, allowing in this 20 minutes for the medical officer to look round the train and see that all is correct.

In the Austrian Service rest stations (*Kranken-Haltstationen*) are established all along the line of rail. They are of two kinds, viz., rest stations with, and rest stations without, night accommodation (*Kranken-haltstationen mit*, and *Kranken-Haltstationen ohne Nachtruhe*). They are equipped by the G.O.C. Lines of Communications, or by the Ministry of War, according as they are on the Lines of Communications or in the Home Territory.

Rest stations without night accommodation are intended to afford temporary attention, food, and refreshment to sick passing through. They are established at all points on the line of rail where rationing stations (*Verköstigung-Stationen*) exist. Cases unable to bear further travelling may be detained. The establishment consists of one medical officer and four to six attendants. Civilians may be made use of. Rest stations with night accommodation are posted at despatching stations (*Abschubs-Stationen*) and at important points along the line of rail. They are, as their name implies, intended to afford more permanent shelter, etc., to parties of sick passing through. The following establishment is allowed, viz., one medical officer, 10 N.C.O.'s, and 15 men (including an instrument orderly and two cooks), and one officer's servant, from the Sanitary Corps or from the Aid Society. Two such, equipped for 200 men each, are allowed for each army corps on the Lines of Communications, apart from those in the Home Territory. They have a definite and fairly extensive equipment of drugs, surgical appliances, and clothing, and extra equipment may be procured on requisition. A station of this kind should include a large kitchen and refreshment and sleeping rooms. The cubic space allowed need not be more than 30 cubic feet per head in view of the passing nature of the occupation. Special wards for men unable to proceed, and for infectious cases, should also be provided. Previous notice should always be given these stations of the arrival of sick, so that the preparation may be made in advance.

The Italians arrange, as a rule, that the party should be fed only at the beginning and end of a day's journey. When this cannot be managed, the medical officer in charge of the train should select some intermediate station that suits the general arrangements, and inform by wire the communications authorities and the local commandant of his intention to feed the men there. He will request the latter to inform him by wire at some intermediate station whether or no his indent can be complied with. Should this resource be unavailable, he may indent on any competent supply authority for an issue of reserve rations, or, in the last resort, purchase locally, using the imprest at the disposal of the train accountant for this purpose.

As regards the transfer of patients, procedure in case of death, and so on, the rules are the same as in the case of permanent Hospital Trains.

The documents are the same for the two classes of trains, except that in the German Service no formal nominal roll is sent with the train, the patients not being looked on as forming a definite unit, as in the case of permanent Hospital Trains.

In the German, Austrian, and Italian regulations, no special directions are given for the disinfection of this class of train.

The French direct that the carriages should first be swept and sluiced with water, both inside and out. They are then either:—1. If possible exposed to the action of a jet of super-heated steam, or boiling water is sprayed into them. The corners are to be specially attended to. This method should always be preferred to any other. 2. In the case of this being impossible, solution of chloride of zinc 5 per cent., carbolic acid 5 per cent., corrosive sublimate 1 per cent., or some other disinfectant fluid should be used to thoroughly swab out the carriages.

At the end of the journey, in the German Service, as soon as all the patients have been handed over, the entire establishment returns without delay to the Sick Transport Committee which originally detailed it for the duty. All equipment which needs cleaning accompanies it, the commandant being responsible for its custody. The entire establishment will, as far as possible, be kept together as a separate unit, but the committee may detach any member or members of it, at discretion, for other work.

In the French Service it is laid down that, with a view to accelerating the return of the establishment and equipment to the advanced railway terminus (*station tête d'étapes de guerre*), the patients in a train will, as far as possible, be despatched to one or, at the most, two stations in the home territory. The stations in question will be selected by the P.M.O. at the Distributing Station (*gare point de répartition*). The *officier d'administration* accompanying the train is responsible for all equipment which should be sent on to the district dépôt (*gare de rassemblement*), and thence forwarded with the establishment as one unit to the advanced railway terminus.

The Austrians give no special instructions. It is obvious, however,

that from the purely local nature of the train, the establishment and equipment must return to the command from which they started.

In the Italian Service a *Treno Attrezzato*, after having completed a journey, may at once proceed on a new trip, under the orders of the intendant, and on the recommendation of the P.M.O. of the Field Force. If not wanted immediately, the establishment comes under the orders of the communications authorities, and will as a rule be attached for duty to some hospital, a guard being detailed to look after the train and its equipment. A *Treno Attrezzato* once made up is a permanent unit, with a permanent equipment, but without a permanent establishment. *Treni Provvisori* are on the completion of a journey broken up, the establishment rejoining its original post.

#### ORDINARY TRAINS.

The third class of train used for the transport of the sick and wounded comprises ordinary trains, used with or without previous preparation, or adaptation, either purely for such traffic or as mixed trains. (Germany, *Krankenzüge*; France, *Trains Ordinaires*; Austria, *Gewöhnliche Züge*; Italy, *Treni Ordinari*.) These trains are as a rule used only for such cases as are able to sit up; in time of great stress, however, they may be used for the carriage of serious cases over short distances.

In the German Service they are made up of passenger carriages of the first three classes, if possible; goods vans may, however, be used, straw palliasses being supplied for the sick to lie down on. These will be specially useful if fitted with side attachments, through which poles may be passed, so that the whole palliasse may be used as a temporary stretcher. Care is enjoined in using this method that the patients are so placed as to be able to shift their position if necessary. In this manner seven or eight men may be placed in a single van. The Sick Transport Committee is responsible that these vans are properly fitted up, and for the general preparation of the train, as well as for the provision of such equipment as may be necessary. The train is made up emergently from such rolling stock as may be at hand, but carriages once told off for this work may not be diverted to other objects till the journey is completed. When a long journey has to be made, the committee is responsible that a halt is made for the night at a station where the sick can detrain and get food, etc. The station commandant is responsible for the necessary preparations being made at these stations. These rules may be taken as those followed in all Services, though in no other are the directions given so complete. It is obvious that from the purely local and temporary nature of these trains, their working and running must rest with local authorities, and depend on local conditions, the general rules that govern the working of the more completely organised trains being kept in mind.

The Germans allow two men of the Military Police to the train, and one attendant per carriage with an under-officer as commandant. These may be relieved during the journey, or accompany the train throughout.



A medical officer should always superintend the entraining of the convoy, and medical officers should in addition be detailed to meet the train at every halt. Their chief function will be to remove such cases as seem unable to continue the journey. Medical officers never accompany these trains, but the proportion of attendants may be varied at the discretion of the despatching authorities. In the Austrian and Italian Services there is practically very little difference between the working of these trains and of *Krankenzüge* or *Treni Provvisori*, as the case may be.

The following remarks may be offered on the general subject of Hospital Trains:—

As regards permanent Hospital Trains.

1. *Size*.—The German train has the great advantage of being the largest train. The advantage lies firstly in the fact that one large train does not, as regards traffic arrangements, take up as much space on the line as two trains of half the size; inasmuch as the distance between any two trains, or the intervals of time at which they are despatched, does not depend on the size of the trains, except in so far as this affects the time taken in loading. As a large train has a correspondingly large establishment, this influence is negligible. The second advantage lies in the fact that the specially fitted carriages, viz., those for the kitchen, medical officers, etc., do not need to be multiplied in direct ratio to the size of the train. The disadvantages are:—*a*. Diminished speed. The pace of military trains on the Continent is, however, in any case so slow that this influence may be neglected, except where the gradients are steep, which is the exception on the central plain of Europe. This point would, however, be one of considerable importance in India, where the steep gradients of the frontier lines, e.g., the Bolan, would very seriously limit the size of Hospital Trains. *b*. The difficulty of providing sufficiently lengthy platforms for entraining and detraining. This, however, may be obviated by the erection of temporary platforms, or the use of ramps or gangways.
2. *Arrangement*.—The Germans, French, and Italians have their medical officers' carriage at the head of the train, the Austrians place theirs in the centre. The latter is indubitably the better plan, as the medical man is thus nearer to his patients, especially to the more serious cases, which should always be placed towards the centre. The kitchens in the German and French trains seem too far from the centre of the train; this causes delay in serving food to the patients, and in the French train the position of the kitchen only three from the end of the train must expose it to much oscillation, and thus impede the work of the cooks.

The main advantages of Permanent as compared with Improved Hospital Trains are :—

1. The continuous treatment and attention that can be given to the sick during the journey.
2. The greater comfort of the sick in the matter of clothing, bedding, etc.
3. The possibility of running them through without halts for refreshment, or at night.

Their disadvantages are :—

1. Expense.
2. The fact that they can practically only be used for the single journey from front to base, and must run empty or nearly so from base to front. The Austrians indeed use their permanent Hospital Trains for the transport of dry goods (other than medical stores) to the front, and also couple on to them, when running empty, waggons containing warlike stores. This is a proceeding of very doubtful propriety. A permanent Hospital Train is a permanently protected unit, and to use any portion of it for the carriage or haulage of any but medical stores or patients, is to infringe the neutrality of the entire unit. In the case of a successful raid being made on the lines of the communications, as happened so frequently in the American Civil War, any train so used would infallibly be destroyed as it stood. It can hardly be expected that the raiders, pressed as they would be for time, would stop to discriminate between waggons that carried medical and those that carried commissariat stores, once they realised that the Red Cross covered either indifferently. Any such even apparent tampering with the principles of the Geneva Convention is much to be deprecated. It may be noted that the Indian Railways fall into the same error, carriages marked in a permanent manner with the Red Cross being used for the conveyance of troops.

The advantages of Improved Trains are :—

1. Their cheapness.
2. The readiness with which they can be made up and prepared.
3. The fact that after use for the carriage of sick from front to base they can be utilised for any class of traffic from base to front.

Their main disadvantage lies in the fact that they must stop at certain places for the feeding and dressing of patients, and that therefore they can only run for a limited number of hours in the twenty-four, and can only start at such times as will permit of their arriving at the proper rest stations at the proper times. This inconvenience might to a certain extent be obviated by the provision of a kitchen wagon to these trains.

It need not be elaborately fitted up; a good sized kerosene or similar stove should suffice for the preparation of diets, and metal plates and utensils could be supplied for the use of the patients. The train would still have to stop to feed the passengers, but the stops could be made at any convenient station or siding, and not only at the established rest stations. On the whole it may be said that permanent Hospital Trains are admirable units for use on the rearward half or two-thirds of the Lines of Communications or in the Home Territory, but it is very doubtful whether they could ever be much used at the front, except during armistices. The experiences of the Franco-German War are too one-sided to be of real value in this respect.

The following authorities may be mentioned :—

*German.*—Hirschberg. “Die Bayerischen Spitalzüge im deutsch-französischen Kriege.” 1872.

Zur Nieden. “Der Eisenbahntransport verwundeter und erkrankter Krieger.” 1883.

Virchow. “Die erste Sanitätszug des Berliner Hilfsvereines.” 1870.

*Austrian.*—Cron. “Der Dienst bei einem k.u.k. Eisenbahn-Sanitätszuge.” 1896.

Myrdacz. “Die Thätigkeit der k.u.k. Schiffsambulanzen und Eisenbahn-Sanitätszüge im Jahre 1878-79.” 1880.

Wasserfuhr. “Vier Monate auf einem Sanitätszuge.” 1871.

*French.*—Rédard. “Transport des blessés par chemins de fer.”

The Germans, French, and Austrians give instructions on these points in their Field Medical Regulations. The Austrians publish also “*Normale für Eisenbahnsanitätszüge*”; and the Italians have a special publication, the “*Regolamento pel trasporto sulle ferrovie dei feriti e malati in guerra*,” of which the last edition is dated 1896.



## INDEX TO DIAGRAMS.

## DIAGRAM I. GERMAN.—

- Fig. 1. Suspension Apparatus, Hamburg System.  
 Fig. 2. Grund's System. Longitudinal View.  
 Fig. 3. Do Do. Cross Section of Carriage.  
 Fig. 4. Stretcher as used in Permanent Hospital Trains. Side View.  
 Fig. 5. Stretcher as above, in ground plan, showing the attachment for widening bed; used in three stretchers in each carriage.  
 (From *Kriegs-Sanitäts-Ordnung*, 1888, Bl. 2 and 4.)

DIAGRAM II. FRENCH.<sup>1</sup>—

- Fig. 1. *Appareil à trois étages*, with stretchers *in situ*.  
 Fig. 2. Bry-Ameline System in cross section; the numbers denote the order in which the stretchers are loaded.

## DIAGRAM III. ITALIAN.—

- Fig. 1. Iron hook (*Grappa ad uncino*), used for suspension in Improved Hospital Trains.  
 Fig. 2. Sling used in Improved Hospital Trains, in face.  
 Fig. 3. The same. Inside view.  
 Fig. 4. Bracket Suspension (*Montante a mensola*), used in Permanent Hospital Trains.  
 Fig. 5. Stretcher used in Permanent Hospital Trains (*Barella-Lettuccio*).  
 Fig. 6. Side view of Suspension Apparatus used in Improved Hospital Trains, showing method of fastening supports to walls of carriage.

(From *Regolamento pel trasporto sulle ferrovie dei feriti e malati in guerra*. 1896.)

<sup>1</sup>The illustrations of the French Systems are from the *Règlement sur le service de santé de l'armée en campagne*. 1895.

## APPENDIX A.

Comparative statement showing composition and arrangement of Permanent Hospital Trains in the various Armies:—

	GERMAN.	FRENCH.	ITALIAN.	AUSTRIAN.	
1	Baggage	Baggage	Baggage	Baggage	1
2	Baggage	Medical Officers	Medical and other Officers	Sick Carriage	2
3	Medical Officers	Sick Attendants	Accountant and Sick Officers	Do.	3
4	Subord. Estab.	Sick Carriage	Sick Carriage	Do.	4
5	Sick Carriage	Do.	Do.	Do.	5
6	Do.	Do.	Do.	Do.	6
7	Do.	Do.	Do.	Do.	7
8	Do.	Do.	Do.	Medical Officers	8
9	Do.	Do.	Do.	Provision Store	9
10	Do.	Do.	Do.	Kitchen Waggon	10
11	Do.	Do.	Dispensary and Provision Store	Subordinate Establishment	11
12	Do.	Surgery, Dispensary and Linen Store	Kitchen	Sick Carriage	12
13	Provision Store	Sick Carriage	Sick Carriage	Do.	13
14	Kitchen	Do.	Do.	Do.	14
15	Sick Carriage	Do.	Do.	Do.	15
16	Do.	Do.	Do.	Do.	16
17	Do.	Do.	Do.	Do.	17
18	Do.	Do.	Do.	Do.	18
19	Do.	Do.	Do.	Store Waggon	19
20	Do.	Do.	Officers' Servants		
21	Do.	Kitchen	Spare Sick Carriage	21	
22	Surgery & Dispensary	Kitchen Stores	Store Waggon	22	
23	Sick Carriage	Provision Store	Baggage	23	
24	Do.				
25	Do.	25			
26	Do.	26			
27	Do.	27			
28	Do.	28			
29	Do.	29			
30	Kitchen	30			
31	Provision Store	31			
32	Sick Carriage	32			
33	Do.	33			
34	Do.	34			
35	Do.	35			
36	Do.	36			
37	Do.	37			
38	Do.	38			
39	Do.	39			
40	Subord. Estab.	40			
41	Fuel	41			
			The above is calculated at a rate of fifteen patients per carriage; the regulation merely lays down one half of the sick carriages in front of the dispensary and the remainder behind the kitchen.		

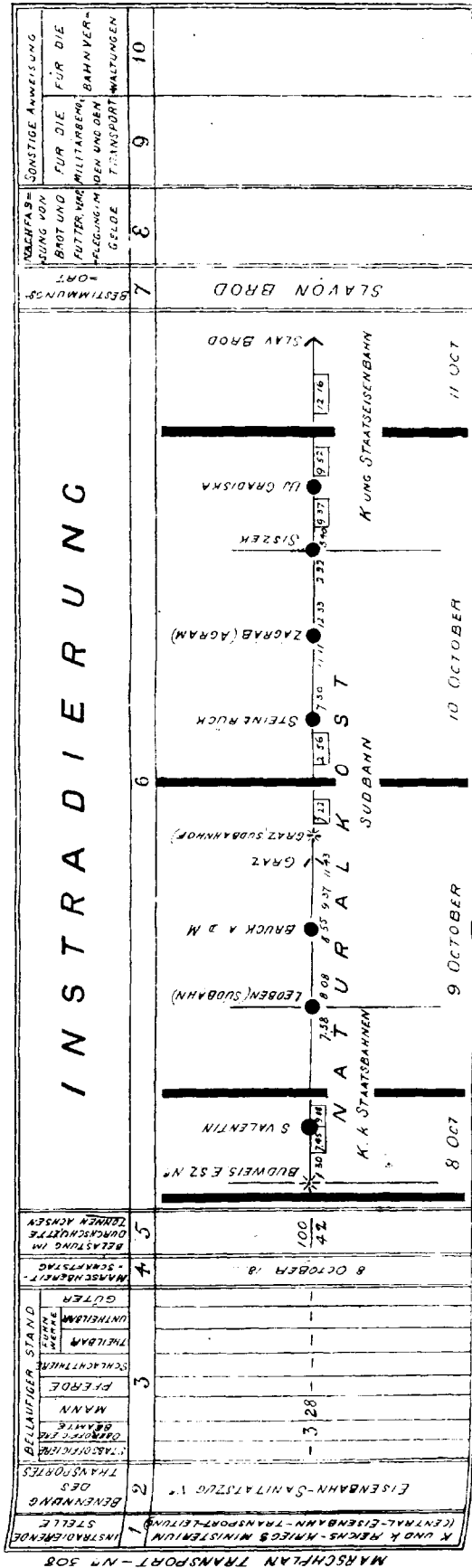
## APPENDIX B.

Comparative Statement showing Establishment of Permanent Hospital Trains.

RANK OR CLASS.	GERMAN.	FRENCH.	AUSTRIAN.	ITALIAN.
Medical Officers	1 Oberstabsarzt (S.M.O.) 3 Assistentzarzten	1 Médecin-major 1 Médecin Aide-major	1 Regimentsarzt 1 Ober-(Assistenz) arzt	1 Medico-capo. 3 Medici-assistenti
Other Officers and Officials	1 Accountant	1 Pharmacien Aide-major 1 Officier d'Administration	1 Medicamenten Accessist, for dispensary, accountant's and storekeeper's duties	1 Director 1 Chaplain 1 Military Delegate (a) 1 Accountant 1 Apothecary
Subordinate Establishment	16 Hospital Assistants (a) 16 Attendants for sick (b)	2 Under-Officers 3 Corporals 23 Attendants for sick (c)	2 Under-officers 2 Corporals 6 Lance Corporals (d) 15 Attendants for sick	2 Senior Superintendents 4 Superintendents, 1st cl. 4 do. 2nd cl. 21 Attendants for sick 1 Cook 1 Assistant Cook 2 Kitchen Servants 5 Officers' Servants

REMARKS:—(a) Preferably a captain.  
 (b) One of each of these classes for duty in the kitchen.  
 (c) Including one clerk and cooks.  
 (d) Including two instrument orderlies (*apparat-leute*), two cooks, and one assistant compounder.

APPENDIX C.



\* ——— STATION OF ENTRAINING

→ ——— STATION OF DETRAINING

10 25

HOURS FROM 6 PM TO 5 59 AM DENOTED IN THIS MANNER

8 OCTOBER

DAY FROM MIDNIGHT TO MIDNIGHT

—●— BOUNDARY OF RAILWAY SYSTEMS

DIAGRAM I.

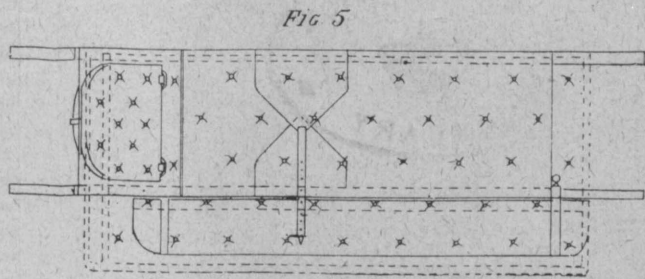
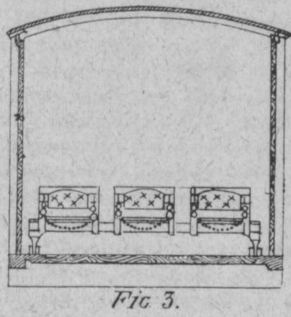
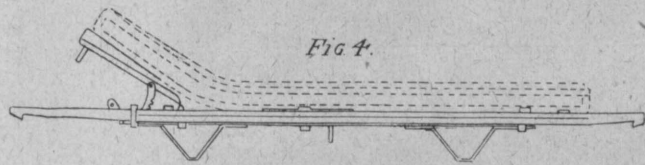
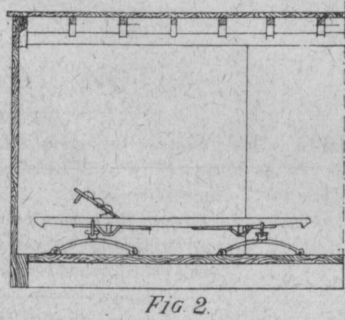


DIAGRAM II.

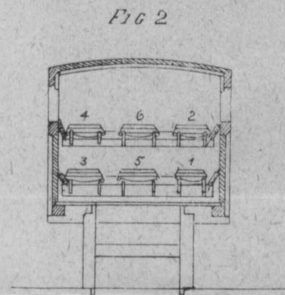
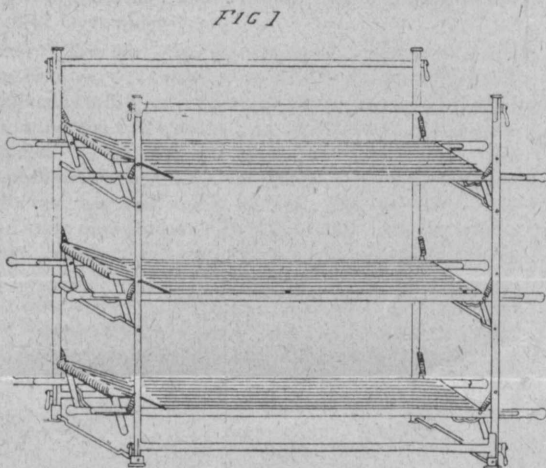
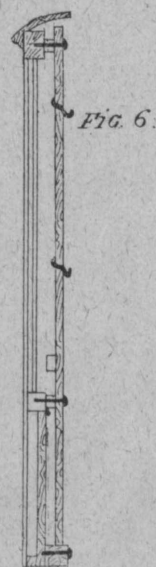
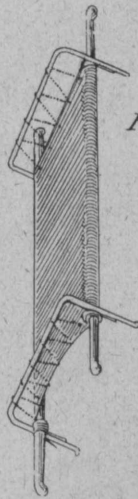
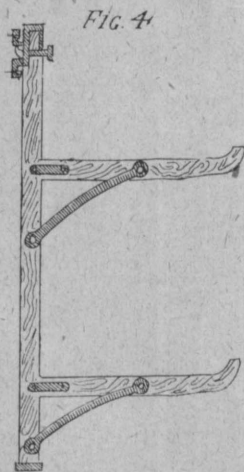
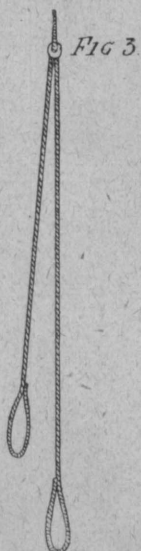
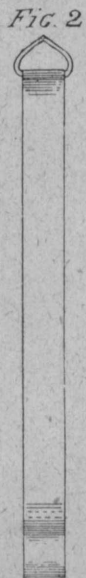


DIAGRAM III.



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1	K. UND K. REICHS-KRIEGS MINISTERIUM (CENTRAL-EISENBahn-TRANSPORT-LEITUNG)	INSTRADIERENDE STELLE
2	EISENBahn-SANITÄTZZUG N <sup>o</sup> ....	BENENNUNG DES TRANSPORTES
3	328	DEKLARIRTER STAND STAßOFFIZIER OBEROFFIZIER KORPUS MANN PFERDE SCHLACHTTHIER THEILBAR UNTHEILBAR GÜTER
4	8 OCTOBER 18...	HAUSENBENEFIT + SCHAFTTAG
5	100 42	BELASTUNG IM DURCHSCHNITT LEBENACHSEN
6		INSTRADIERUNG
7	SLAVON. BROD	BESTIMMUNGS- ORT
8		ZUSAMMEN- SETZUNG VON BROT UND FUTTER UND FÜR DIE WARTUNG GÄLDE FÜR DIE BAHNWIRTS- CHAFT UND DEN TRANSPORT
9		SCHNITTE ANWEISUNG FÜR DIE WARTUNG
10		FÜR DIE WARTUNG

APPENDIX C.

\* STATION OF ENTRAINING  
 → STATION OF DETRAINING  
 10 25  
 HOURS FROM 6 PM TO 5 59 AM DENOTED IN THIS MANNER  
 8 OCTOBER  
 DAY FROM MIDNIGHT TO MIDNIGHT  
 BOUNDARY OF RAILWAY SYSTEMS