

The different methods of lifting and carrying the sick and injured / by G.H. Darwin.

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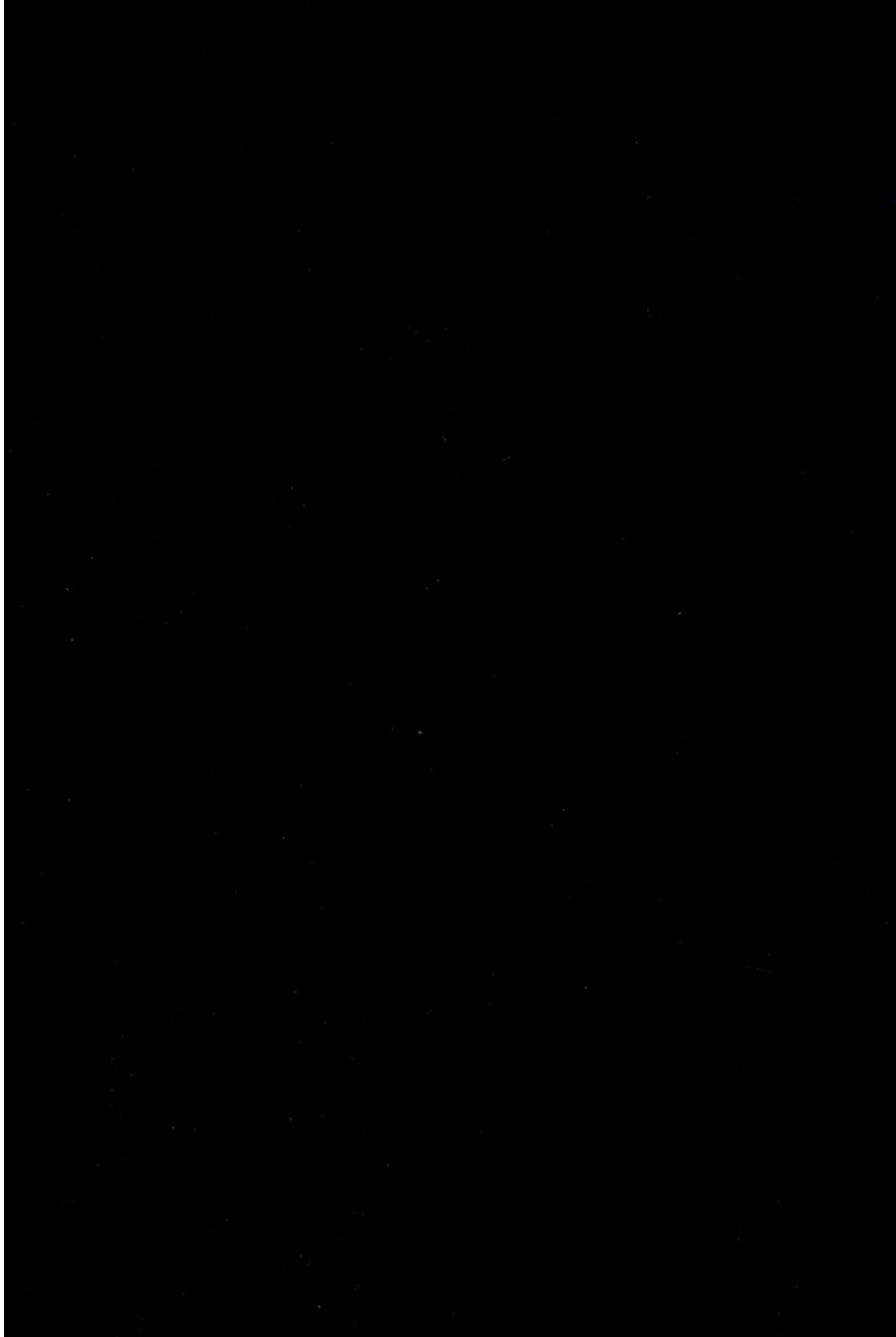
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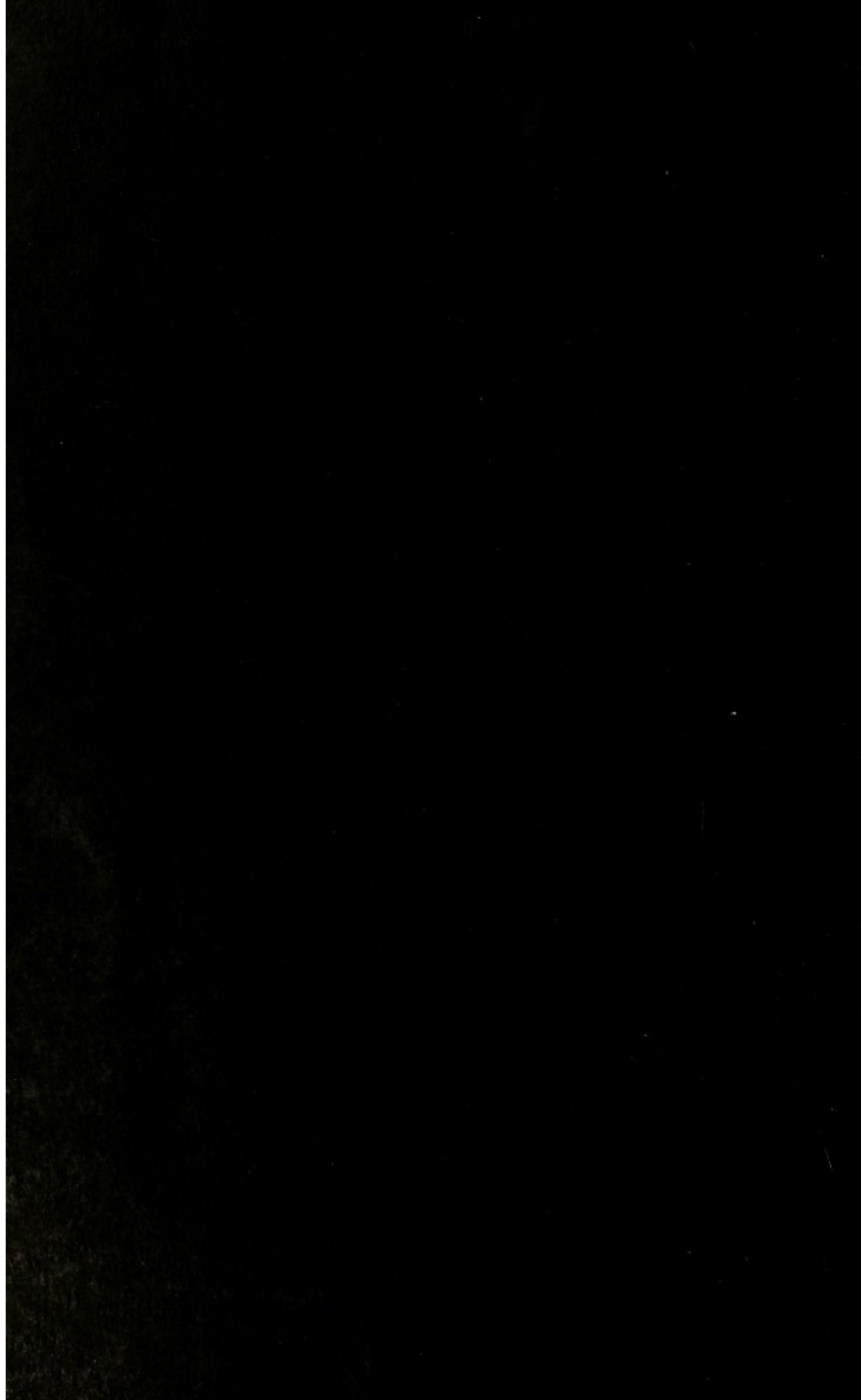
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THE
DIFFERENT METHODS
OF
LIFTING AND CARRYING THE SICK
AND INJURED.

BY
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& Board Schools.*

JOHN HEYWOOD, DEANSATE AND RIDGEFIELD, MANCHESTER;
11, PATERNOSTER BUILDINGS, LONDON.
1888.



R50306

PREFACE.

AT the wish of certain friends, and also knowing full well the utility of a small book on the above subject, I have been led to place this manuscript into the hands of the printer. I entertain the hope that the following pages may prove useful not only to the ambulance student, but also to many who, by their position, will be enabled to show those under them the proper modes of lifting and carrying the sick and injured. I refer more particularly to owners of large works, mills, &c.

Go little booke ; God send thee good passage,
And specially let this be thy prayere,
Unto them all that thee will read or hear,
Where thou art wrong, after their help to call,
Thee to correct in any part, or all.—*Chaucer.*

G. H. DARWIN.

ALBERT PARK,

DIDSBURY, *August, 1888.*

PREFACE

The first part of this book is devoted to a general survey of the history of the subject, and to a discussion of the principles which should govern the treatment of the subject. The second part is devoted to a detailed examination of the various methods which have been employed in the treatment of the subject, and to a comparison of their merits and demerits. The third part is devoted to a discussion of the various theories which have been advanced in regard to the subject, and to a comparison of their merits and demerits. The fourth part is devoted to a discussion of the various applications of the subject, and to a comparison of their merits and demerits. The fifth part is devoted to a discussion of the various theories which have been advanced in regard to the subject, and to a comparison of their merits and demerits. The sixth part is devoted to a discussion of the various applications of the subject, and to a comparison of their merits and demerits. The seventh part is devoted to a discussion of the various theories which have been advanced in regard to the subject, and to a comparison of their merits and demerits. The eighth part is devoted to a discussion of the various applications of the subject, and to a comparison of their merits and demerits. The ninth part is devoted to a discussion of the various theories which have been advanced in regard to the subject, and to a comparison of their merits and demerits. The tenth part is devoted to a discussion of the various applications of the subject, and to a comparison of their merits and demerits.

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TRANSPORT OF THE SICK AND INJURED.

CHAPTER I.

INTRODUCTORY.

It is not many years ago, that the provision for help to the accidentally injured, in our own city streets was left to the uninstructed and haphazard generosity of chance passers by. I have known a man severely injured, by a street accident, to be left lying nearly one hour in the midst of the roadway through a densely populated district in which the accident took place, waiting in the first place for a policeman, and next, while the policeman, after he had been found, went to the distant police office and returned with a stretcher and assistance to remove the injured man to the hospital. Nor was that the worst of the matter, for the assistance when obtained was unskilled, and it not unfrequently happened that in ignorant zeal, while endeavouring so far as they knew, to help the wounded, often really greatly aggravated his injuries. A story is told of a great surgeon of the last generation who had the misfortune one frosty morning to slip down, while on his way to hospital duties and break his leg. The people around flocked to him and would have lifted him up, but he struck at them so savagely with his stick that they were obliged to leave him untouched, until he could tell them his name and send a messenger to the hospital for a stretcher and skilled help. Now what was the reason of this conduct? The surgeon knew by long experience the danger of such well-meaning but uninstructed interference; he had seen hundreds of what had been in the first instance causes of simple fracture of the leg, needing only a short period of rest and immobility in properly applied splints for complete recovery, turned in an instant by unhappy though well-meant attempts at removal, into severe and in those days long-continued, cases of compound fracture, the ends of the broken bone protruding through the rent skin and torn muscles, and open to all the evils, which we now know to be carried about by the air of our crowded cities. It was a wise, though to the people so brusquely repelled, it must have seemed an ungrateful act. But now-a-days, thanks to ambulance lectures, the efforts of the

St. John Ambulance Association, of volunteer ambulance corps, of teaching of policemen, workers in mines and machinery, and the general popularising of this subject we are on the way to better things, and it is with the hope of assisting the people to reach that end that I have endeavoured in the remarks to follow, to place before, *primarily* my own men of the medical staff, and *secondarily*, those of the bodies before-mentioned and the general public, that I have undertaken this task.

It is not an uncommon state of mind among the students of an ambulance or "first aid" class, to think that when a pad has been well and accurately placed upon a wounded artery, or some cleverly improvised splints adjusted to a broken limb, or some other injury neatly bandaged, the work is finished. This is not so; sometimes and by no means infrequently it will happen that the most difficult part of the task has yet to be done, and that is to discover how best to remove the injured person. The varying circumstances under which injuries are received, or illness may occur, make this an extremely important consideration, and one of even greater importance and complexity in civil than in military life.

On the field of battle, on the parade ground, in the camp or in barracks, there is plenty of scope and room, ready assistance, skilled and trained bearers, stretchers, light, space, and air; in the dark passages of coal or metal mines, in the narrow passages, between whirling wheels that carry death, and mutilation in their revolutions, in the heat, glare, and distraction of the foundry or the mill, there are none of these things, and the man who desires to be of service, to his fellows in their direst hour of agony, must have clear wits and intelligence of no mean order to choose on the spur of the moment, amid the distractions of horror, and perhaps fear for his own safety, the best and most feasible of the measures practicable under the circumstances of the case. These circumstances will be varied by the cause of injury, as, for instance, the case of injury inflicted by a fall of roof in a mine, when it may be impossible for more than one person to get near enough to the patient to afford any assistance, or a person unconscious from choke-damp or the inhalation of other noxious gases; or of smoke, as in a burning house—in such cases it would be unwise to expose more men than are absolutely necessary for the purpose of rescue, to such imminent danger, and the great object is the instant removal of both the unconscious patient and the yet conscious rescuer from the noxious influence. In such cases as these the mode of removal becomes quite secondary to the imperative necessity for the immediate performance of the act, but in other cases, as, for instance, severe machinery accidents, it will often be requisite to perform some of the acts necessary for the arrest of

bleeding, or for the rendering immobile, the extremities of fractured bones, before proceeding to removal. In the latter case (that of fractured bones) or when the patient is unconscious from whatever cause, he should be placed upon a stretcher of some kind, whenever it is practicable; but it will occasionally happen that from the peculiar circumstances of the case the urgency of removal is so great, that even in these cases, the risks of increasing the injury become less than the risk of leaving the injured person in the position in which he is found. Of this kind are injuries on the field of battle under heavy fire, in dangerous parts of mines, when there is impending danger of fresh falls of roof, or of choke-damp after explosions, injuries in the roadway of crowded thoroughfares, in cities not yet provided with effective or sufficient ambulance service, and in many other positions, which will at once occur to the thoughtful mind. In all these cases, however, the distance to which the patient is removed should be the shortest possible, no further than to bring him within reach of the proper means and appliances, and out of reach of immediate danger. The days are past when unfortunate wretches with broken limbs, or bleeding vessels, were tortured in jolting carts, or those fainting from shock or loss of blood were propped up in shaking rattletraps, called cabs, for perhaps miles, and there are but few districts where there will not be found some one capable of applying a first aid dressing to arrest dangerous hæmorrhage, and to keep broken bones from piercing through the soft parts of a limb, and of devising some mode of improvising a stretcher, or a sling by which the necessary removal may be effected without thereby aggravating the original injury.

Up to the present, even our best surgical text books, admirable in most respects as they are, have not given even the slightest space to this very important subject; they are most minute and careful in their description of the details of the application of dressings, and of the treatment of the injuries themselves, but there is scarcely a word or a hint as to the methods of removing, or the best modes of lifting and carrying the sick and injured.

To provide some instructions as to the best modes of doing these things, and to place clearly before my readers the principles upon which the value and practical use of these appliances depend, and at the same time to furnish a few hints, which may lead to some fruit in emergencies, when the means of conveyance are absent or insufficient, by opening their minds to the possibilities of contrivances for improvising substitutes from whatever means may be at hand, are the objects at which I aim, and the attainment of which will, by affording relief to suffering in the hour of greatest need, and of satisfaction and self-approval in the minds of those so enabled to be of use to their fellow-creatures, be to me its own and "a sufficiently great reward."

CHAPTER II.

ON MODES OF IMMEDIATE REMOVAL WITHOUT STRETCHERS OR OTHER APPLIANCES.

THE first part of our subject, is necessarily the most simple and the most urgent. It may arise in civil life, at any moment. A policeman on his beat finds a man lying unconscious in the street. The cause of that condition does not concern us here; it may be drink, it may be apoplexy, or it may be injury; the necessity is speedy removal for safety and examination. A man falls down suddenly in the midst of a crowded thoroughfare on a hot summer day; a fireman on duty in a burning building finds the body of



FIG. 1.—CARRYING UNCONSCIOUS MAN.

some person lying on the floor of a room filled with smoke; a party of colliers hastening to the mouth of the shaft after an explosion in some part of the mine, find one or more of their number falling to the ground, when to leave them is certain death. All these and a hundred other cases in civil life call for immediate removal, and in military contingencies these conditions are continually happening when the fire is heavy and close. Let us take the first case as an illustration. A policeman, say on a night beat, finds a man lying unconscious in the road. It is not his

duty to diagnose the cause of this condition, further than a cursory observation to see whether there are any wounds about him, especially about the head, and whether there are any signs of struggling, or suspicion of robbery or violence ; the next thing to be done is to remove him from a place where he is in danger of sustaining further injury to one when he can be examined by responsible and competent authority. For this purpose he takes a position on the right of the unconscious man, turns him over on his face (taking care to put something under the head, so that the breathing shall not be interrupted), and extends his arms in a line with his body. Then lifting him up into a kneeling position, he



FIG 2.—CARRYING UNCONSCIOUS MAN.

pushes his right shoulder under the unconscious man's chest, places his right arm over the thighs and round the right leg, and at the same time, with his left hand grasps the man's left wrist and draws it across his (the bearer's) own chest, finally catching it with the right hand and so holding it. (See Fig. 1.) In this way one arm of the bearer is left free, and with a little practice, an ordinary man is easily carried. It is evident here, that this mode of carrying may, if it be for any reason necessary, be reversed ; that is, supposing the case of a soldier under fire, who has been wounded in the right thigh. In such a case the bearer would, of course, get to the opposite side of the patient, and place his left arm round the left leg, and seize the right wrist with his right hand, finally transferring it to the left. I have known the case of an officer,

who was carried for half-a-mile in this way, after he had been shot through the body and had his ankle shattered by a slug, in the Maori wars, and eventually recovered.

If the patient be a child, a woman, or a slightly made adult, and the bearer be strong enough, he or she may be carried in the arms as Fig. 2. This mode of carriage is, however, neither as convenient nor so easy to the bearer as the one previously described, as the body of the patient is in front of the bearer and in his way in descending a ladder, for instance, as from a burning house and increases the danger of slipping.

If the patient is conscious and not too severely injured to be able to render some slight assistance to his bearer, he may be carried pick-a-back, (see Fig 3), clinging with one or both arms to



FIG 3.—CARRYING UNCONSCIOUS MAN.

the neck of the bearer, or if the injury be but slight, it may be sufficient to place one's self by his side, hip to hip, the bearer's arm round the injured man's waist and the patient's arm round the bearer's neck.

When there are two bearers the removal of the patient becomes a task much easier of fulfilment, especially if we have the proper appliances at hand, but in the cases we are now dealing with it is taken for granted that there are no such means of carriage within immediate reach, and the necessity for speedy removal is, from some of the causes previously mentioned, urgent. If the patient be unconscious he may be carried

(a) By the bearers grasping hands—two under his buttocks and two under his shoulders—or

(b) If from the position the bearers can only get to one side of the injured man, one will place one arm under his neck and the other under the back, while the second will place his arms, one under the buttocks and the other under the thighs.

(c) There is a third but the most clumsy and unsafe of the modes we are describing, and it should not be used unless from some peculiarity of circumstance or position it cannot be avoided. It consists in one bearer grasping the shoulders of the injured man and the other taking his legs, and it will be evident that there are circumstances in which it may be compulsory to adopt it, as in a narrow passage in a mine, or between machinery, when it is impossible to get to the side of the patient.

If the patient be conscious he may be carried by means of an improvised seat, of which there are several varieties, and of which we shall treat in the next chapter.

There is one caution which it is perhaps scarcely necessary to mention in these days of general intelligence and widely-spread information, and yet it would be a defect to omit to give it in a work devoted to the teaching of this subject. It is that a patient shall never be carried face downwards: sudden death has not infrequently ensued, when carrying men in that position known to soldiers as the "Frog's March."

CHAPTER III.

IMPROVISED SEATS.

THESE modes of removal are of great value, in cases where the injury is not extremely severe, and the patient is conscious; when there is a condition of shock, fainting, severe hæmorrhage, and insensibility, some of the other modes by which he may be carried in a horizontal position should be adopted. But in suitable cases, and in the absence of stretchers and other appliances for the aid of the wounded, one of the following modes of forming these seats, can be used.

1. The two-handed seat (see Fig. 4) is formed by two bearers facing each other, and locking together the hands which are most to the front, upon which the patient is seated, and the other pair

of hands are passed behind the patient to each opposite bearer's shoulder. If the patient be weak and feel faint he can, in this way, by slightly raising one pair of arms and lowering the other, be carried in a position very nearly approaching the horizontal, a very valuable and important practical point in many cases.

It is to be noted that in the valuable work on "First Aid to the Injured," issued by the St. John Ambulance Association, a sketch of this form of improvised seat is given, in which the bearers are represented with the hands forming the seat clasped with palms uppermost. This is a defect in an otherwise admirable publication, for practical experience teaches that in this posture



FIG. 4.—THE TWO-HANDED SEAT.

the hands of the bearers become speedily tired and cramped, and if the distance to which the patient has to be removed be anything but short, he will have to be put down, to allow them to recover, a thing to be strictly avoided in all cases of carrying or lifting the sick or injured. In all these forms of improvised seats, then be it remembered, that the knuckles should be uppermost of the hands which bear the weight and strain. This form of seat is also valuable in cases when the arms have been so injured as to preclude the patient from rendering any assistance to his bearers. It is also frequently used to lift a helpless patient from a chair to his bed, and then used in this way. A bearer stands on each side of the patient, and passing one arm under his knees, clasps the

hand of the other ; both bearers then pass their arms round the back of the patient and grasp each other's shoulders, and so proceed to lift.

2. The three-handed seat (see Fig. 5.) This form of seat is, in my own experience, the most generally useful of the three forms, and provides both a good firm seat and a support for the back. It is also especially applicable to the case of a person of short stature, a youth or a child.

The three-handed seat is thus made. The two bearers stand facing each other as in making the two-handed seat ; but in this case, one bearer holding up his own left arm grasps the thick



FIG. 5.—THE THREE-HANDED SEAT.

portion of the forearm, just below the bend of the elbow, with his right hand, the knuckles being uppermost. The other bearer then grasps the thick part of the first man's right forearm just below the elbow, with *his* knuckles uppermost. At the same time the first man grasps the thick part of the second bearer's left forearm, and thus forms a triangular seat, while the second man passes his disengaged arm (the left) round the back of the patient and seizes the shoulder of the other bearer. This seat is especially advised to be used when the patient feels faint and needs a good firm seat and also some support for the back.

In cases where the patient is able to render some slight assistance, and is not at all faint, we may use the

3. Four-handed seat (see Fig. 6.) This seat is firm and well adapted for cases when the distance over which the patient must be carried is considerable. It is formed by the two bearers standing opposite each other and then each grasping the forearm



FIG. 6.—THE FOUR-HANDED SEAT.

of the man opposite with the disengaged hand. The injured man assists by placing one arm round the neck of each bearer. It is important to remember that in all these cases the knuckles are to be kept uppermost, and it will be seen that each man mutually supports and is supported by his fellow.

CHAPTER IV.

STRETCHERS AND HOW TO CARRY THEM.

OF stretchers there are many forms, and few of them are without faults, but there are two special types which have been approved by Government, and which are used in military service. The old pattern known as Mark I, and two new patterns devised by Surgeon-Major Faris, known as Mark IV and V, which so closely resemble each other that for all practical purposes they may be regarded as one and the same.

There is also the "Furley pattern stretcher," in use by the police, which is a very good, strong, and useful one, provided with straps for slinging from the shoulders. These stretchers are in very general use in civil life, and besides their cheapness and portability, possess the great advantage of having no independent or separate detached parts to be found wanting when most urgently required.

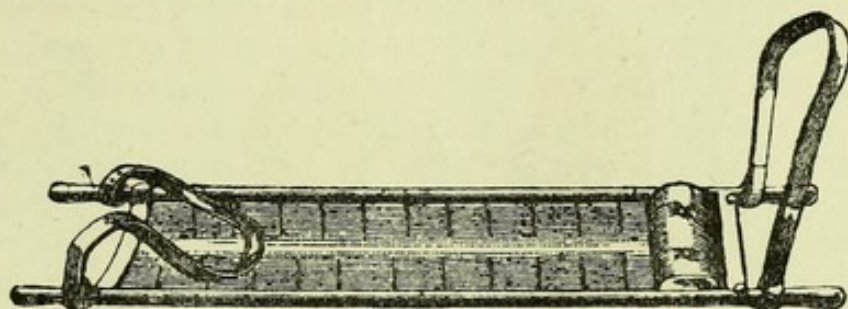
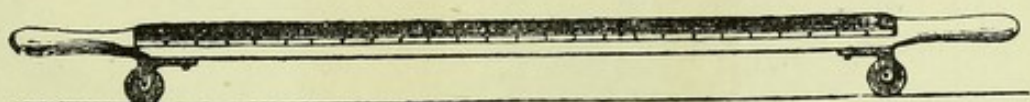
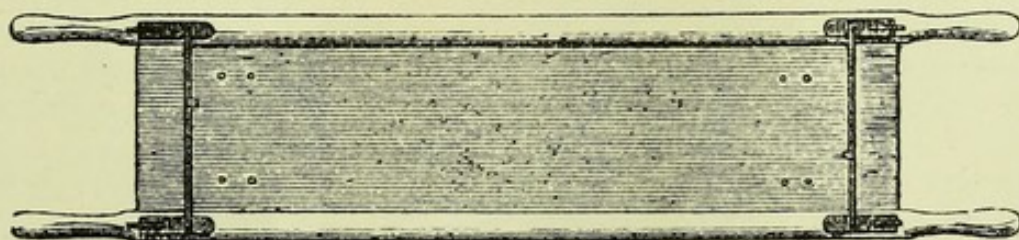


FIG. 7.—FIELD STRETCHER MARK I.

(The slings have recently been fitted with transverse straps.)



SIDE ELEVATION.



PLAN, UNDER.



SLING, WITH TRANSVERSE STRAP.

FIG. 8.—FIELD STRETCHER, MARK V., OR FARIS'S.

(From Manual of Medical Staff Corps, 1885.)

All these stretchers consist of the following parts: Two poles two iron rods, or "traverses," to keep the poles apart and at their proper distance, a canvas bottom and a pillow. The traverses are in the Mark I stretcher simple iron rods fixed to one of the poles at one end by a staple, and bent at right angles at the other extremity to fit into a hole in the opposite pole, about 7in. from its extremity. In Mark IV and V the traverses are jointed, and the under part of the poles are fitted with four rackets, carrying 3in. wooden rollers—a very great and important addition,

facilitating very much the placing of the stretcher and its burden in an ambulance or other vehicle, and saving much pain and jarring to the wounded, and much labour to the bearers. In the Mark I pattern the poles are round ; in Marks IV and V they are square, thicker and stronger. In the former pattern the poles are slipped into plaits made at each side of the canvas ; in the latter, the canvas is tanned and nailed to the poles through an edging of leather with

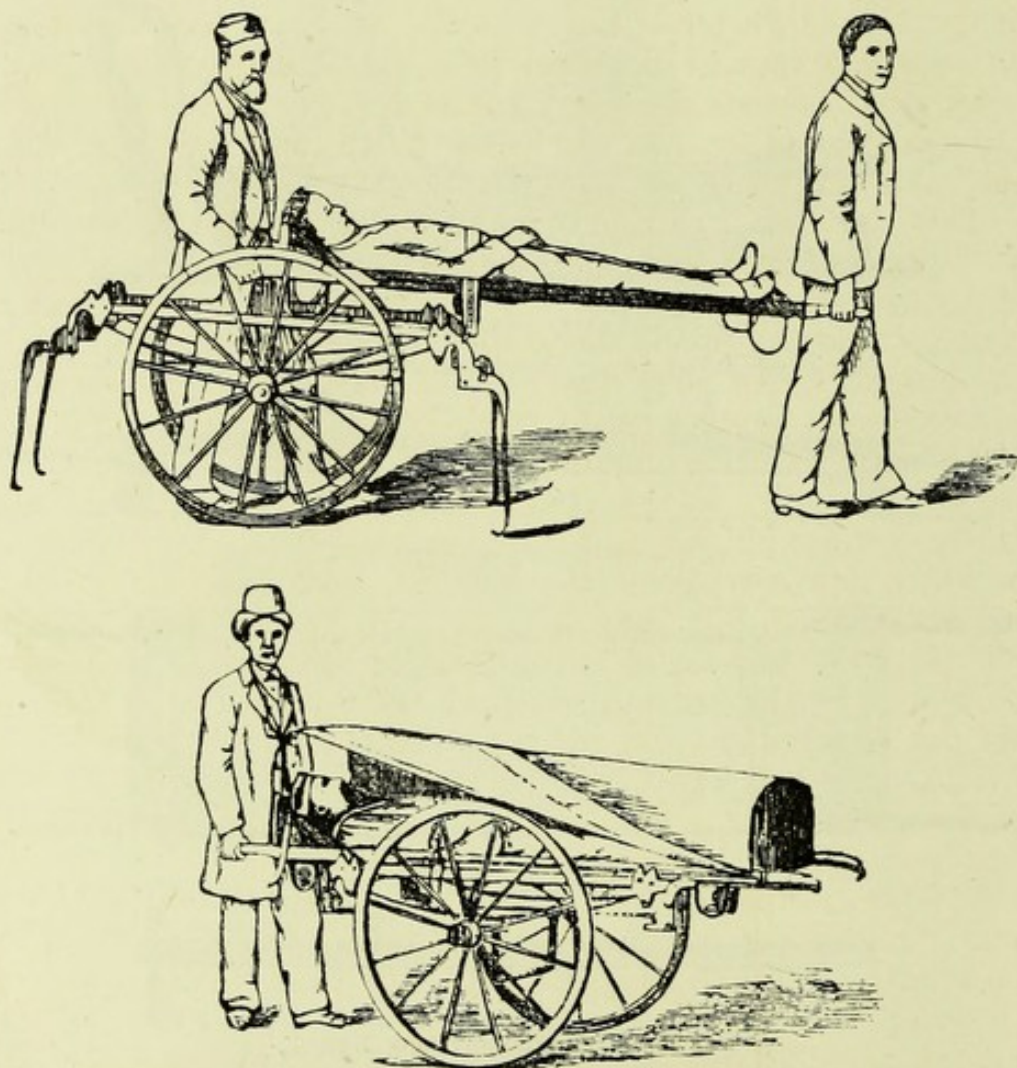


FIG. 9.

(Patented by Mr. John Furley, Honorary Director of Stores to St. John Ambulance Association.)

brass nails. The pillow in the former case is round, and made of horse-hair ; in the latter it is wedge shaped, varying from $3\frac{1}{2}$ in. at the thickest part to $1\frac{1}{2}$ in. in the thinnest. Eyelet holes are made in the canvas of the stretcher for the attachment of the pillow by means of strings. The shoulder-straps are fitted with transverse bands, which serve the purpose of confining the package formed by the stretcher folded up.

The dimensions of the foregoing stretchers are as follow :—

	MARK I.	MARK IV & V.
Length of Pole	8ft. 1½in.	7ft. 9in.
Length of Canvas	6ft. 8in.	6ft. 0in.
Width, total.....	2ft. 2in.	1ft. 11in.
Height	1½in.	5½in.
Weight	16lbs.	32lbs.
Tonnage	—	·08ton.

There is also a very admirable invention, patented by Mr. John Furley, Hon. Director of Stores to the St. John Ambulance Association, which may be described here. It is called the "Ashford Litter," and consists of a folding stretcher, one extremity of which is so raised as to form an automatic pillow, and provided with a removable cover.

This stretcher is carried upon an under carriage of two wheels, on elliptical springs, and so arranged by means of crank-shaped axles, that the bearers can pass between the wheels with the stretcher, and thus avoid the danger and jolting incurred by lifting the injured person over them. We have described above the chief forms of stretcher used in civil and military life, but it is one of the most valuable qualities of the ambulance student to be always wide awake to the possibilities of the service, and to constantly exercise himself in devising extemporaneous appliances for the relief and carriage of the helpless, from such things as are nearest at hand. It may happen even to the best appointed ambulance on the field of battle that the number of stretchers is insufficient for the conveyance of all the wounded, and then it is that the presence of mind and readiness of adaptation on the part of the bearers are called into requisition. In civil life the emergencies are even more frequently so sudden, and so unexpected by those around, that the means and appliances are either too far away, or from some other cause not at the moment available, and the same qualities of readiness and resource find their field and opportunity. The hammocks (Fig. 10) used on shipboard are,



FIG. 10.—HAMMOCK, used during the Ashantee War, 1873-74, arranged with shade for protection from the sun.

(From drawings by Surgeon J. Fleming. From Surgeons Porter and Godwin's book.)

when available, very comfortable and useful means for conveying wounded, and in these days of tennis courts and luxurious lawn hammocks, the means of forming such conveyances are at hand in most suburban and rural districts. There is the advantage that

one strong pole is sufficient for the purpose, though if two can be obtained the substitute for a stretcher is more complete. Blankets with a loop sewn in each corner can, with two poles or two rifles, form a temporary stretcher, by folding the blankets in two, so as to bring all the loops to one side. Through these is passed one pole or rifle, and the other is passed between the two sides of the blanket when folded. If no poles are at hand a patient may be carried in a rug or blanket by four men, one at each corner. A

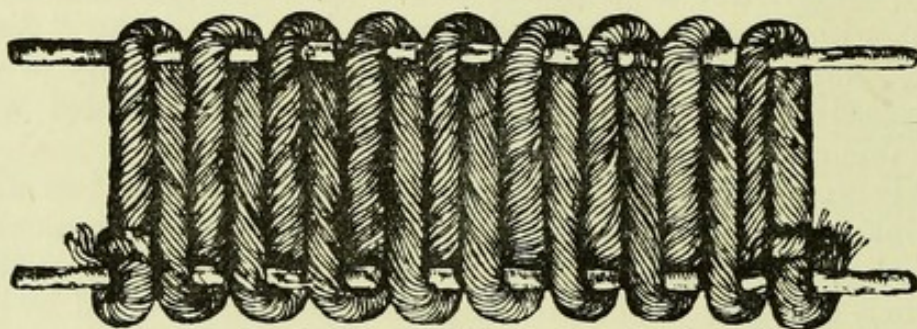


FIG. 11.—STRETCHER, CONSTRUCTED WITH HAY OR STRAW ROPE.

(From Surgeons Porter and Godwin's Surgeon's Pocket Book.)

couple of sacks, always to be found about a farm, and generally about mines, works, and manufactories, cutting holes through the bottoms and passing the poles inside the mouth and through the holes in the bottom of the sacks. The hay bands (Fig. 11), the ropes, the reins or straps of harness in civil life, the straps and belts of soldiers (Fig. 12), and their rifles in military work will all

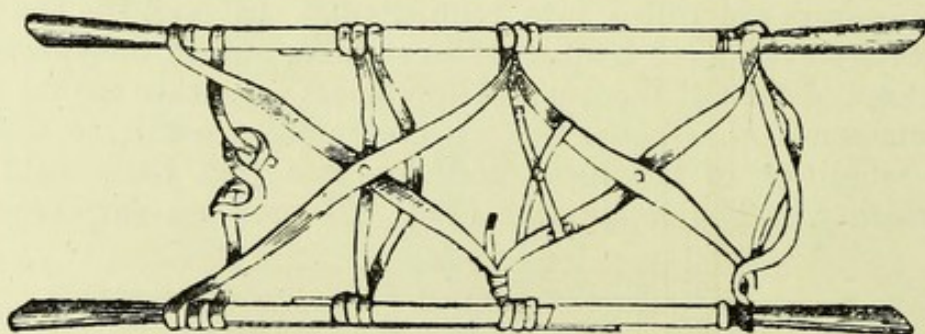


FIG. 12.—STRETCHER, CONSTRUCTED OF FOUR RIFLES, WITH VALISE EQUIPMENT AND STRAP.

(From Surgeons Porter and Godwin's Surgeon's Pocket Book.)

or any of them provide means for making a sort of webbing as a support between two poles, thus providing an improvisation of a stretcher. The garments of the injured man, or his fellows, a couple of coats or vests, or both, turning the sleeves inside out within the garments (see Fig. 13), and buttoning it over the poles or their substitutes; even two or three shirts or a pair of trowsers will

serve the purpose ; or in the field of battle a couple of knapsacks fastened by their straps to a pair of rifles will serve at need. Telegraph wires may also be utilised in the same way, and the cool and thoughtful student will easily extend the list of possible means by intelligent and instructed observation. If the materials at hand are insufficient to form a stretcher in which a man can lie at full length, or if the injury be such as to allow him to sit up, a short stretcher can be easily improvised, which will furnish a comfortable seat from a coat, or other articles of clothing, and in such a case the patient should sit with his back to the front bearer. It is always advisable to try the strength of an improvised stretcher by one of the bearers himself getting upon it before placing the injured man thereon, for nothing is worse, or more distressing, than to see a stretcher break down under the patient.

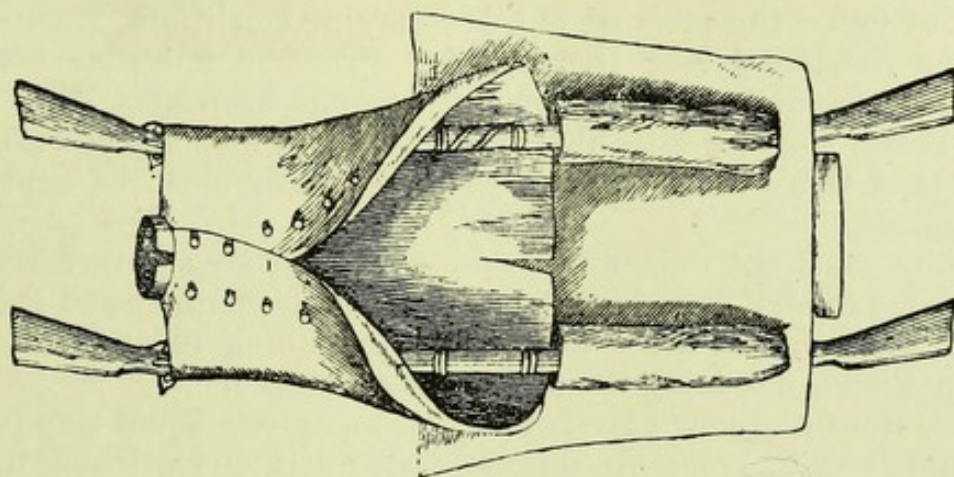


FIG. 13.—STRETCHER, CONSTRUCTED OF FOUR RIFLES AND TWO COATS.
(From Surgeons Porter and Godwin's Surgeon's Pocket Book.)

HOW TO CARRY THE STRETCHER WITH THE INJURED OR SICK MAN.

I have previously remarked that the rules and methods suitable and well adapted for military exigencies, where there is usually ample space and trained and skilful aid, are not in all cases capable of use or applicable to the circumstances under which accidents occur in civil life. Thus in a sudden emergency the ambulance student, who has been taught and knows his part of the stretcher exercise, as detailed in the military manuals, may suddenly find himself called upon to take charge and direction of the removal of a severely injured person, in a cottage, a manufactory filled with whirring wheels and distracting noises, or in darkness and danger in the narrow passages of a coal or metal mine, with the only assistance of well-meaning but utterly uninstructed fellow-workmen of the victim instead of Numbers 2, 3, and 4, of his stretcher detachment; and in place of the regulation stretcher and the arranged ambu-

lance waggon, an improvised stretcher and a common cart without springs ; yet in these cases his training will serve him well, if he but use his knowledge with intelligence, and discarding or altering details to suit the circumstances, bearing clearly in mind the intention and underlying principles which are the *raison d'être* of these regulations. On this point, the remarks of Professor Sir Thomas Longmore are well worthy of quotation. "The military rules," says the professor, "were framed for service in the open air, where there is of course plenty of space, but all such rules must be modified according to circumstances. It is well, I think, to teach the system which is thought to be best, and at the same time to prepare persons for doing that which is next best, when what may be best under other conditions ceases to be applicable." Acting in the spirit of these remarks, I will proceed first to recount the official instructions to bearers, and afterwards to consider how they may be modified under the pressure of other varying conditions.

The front and rear bearers of a stretcher must start with opposite feet, and must not on any account keep step, thus the front bearer starting with his left foot, the rear man starts with the right, and this "broken step," as it is called, must be kept up throughout.

They must not walk with a springy elastic step while carrying a wounded or sick man, but plant the whole foot firmly and evenly on the ground, and lift it as a whole, something like a flat-footed person would, not using the spring from the toes.

The front and rear bearers must use an exactly equal step (with opposite feet), to avoid an uncomfortable jolt and catching up at intervals, very distressing to the patient.



FIG. 14.

The bearers must march steadily, and holding the stretcher as low as possible with bent knees (see Fig. 14), take a step of about 20 inches in length. If possible, men of the same height should be chosen as bearers, and those of the same degree of strength, or nearly, will carry more evenly.

On level ground the patient is to be carried feet foremost, and also when going down hill, unless he has a fractured thigh or leg, under which condition he is best carried head foremost to prevent the weight of the body producing pressure upon the broken limb, and

so cause distress and probably danger of increasing or complicating the injury. Carrying uphill the conditions are reversed ; he is to be carried head first, unless he has a fractured thigh or leg, when for the same reasons as above-mentioned he should be taken feet first.

It is an important thing when slings or shoulder straps are used, to see they are so fixed as to support both poles of the stretcher at an equal distance from the ground. A stretcher should never (if possibly avoidable) be carried over a hedge or wall ; either the bearers should go round until they find a door or gate, or they should make a hole through or pull down part of the wall. Also, it may be well to note that a stretcher should never be carried on the shoulders, as apart from his danger of rolling off in his helplessness, he is beyond the power of observation, and in the field of battle such a misfortune may happen as actually occurred to General Stonewall Jackson, who being wounded and so carried on the shoulders of the bearers, when one of the latter was struck by a shot and fell, precipitating the wounded General to the ground and causing additional injuries, which eventually proved fatal. In crossing a ditch or narrow hollow, the stretcher must first be placed carefully down on the ground, while the first bearer descends into the hollow. He then supports his own end of the stretcher and the other advances it until the back part reaches the bank on the same side of the ditch or hollow, when the second bearer descends. Then the two support and advance the stretcher until the front reaches the brink on the far side of the hollow. Then the front bearer ascends while the rear bearer supports the rear end of the stretcher, and the two lift or push the stretcher far enough to be perfectly safe on the higher ground. Then the rear bearer himself ascends, and the two take up the stretcher again and proceed.

Always bring the stretcher as near to a wounded or sick person as possible. If you have four bearers it should (if circumstances allow) be placed by the side of the patient ; if only three or two then the foot of the stretcher should be placed at the head of the patient in a line with his body. The mode of lifting a patient on to the stretcher will also depend upon the number of bearers available. It is most neatly and satisfactorily done by means of four bearers, who are placed three on one side and one on the other of the patient. The side upon which the three bearers take their stand will be always, of course, the side furthest from the stretcher, and will vary according to circumstances and the nature of the ground. 1st. They should be numbered 1, 2, 4, 3, No. 4 to be the man who gives commands, so that all can act together — a matter of great importance to the comfort of the injured. 2nd. All kneel on one knee (the left if the stretcher is on the right of the patient, and the right if on the opposite side) ; No. 1 passes

one hand under the arm pit of the opposite side of the patient (avoiding any disturbance if the arm be broken) and under the patient's neck, and the other under the shoulder next to him. Nos. 2 and 4, who are on each side of the patient facing each other, pass both arms under the loins and hips, and No. 3 under the legs; or if a leg is broken he holds the broken extremities to prevent movement. If the patient can, he should be told to put his arms round the neck of No. 1. 3rd. They all lift at one moment, raise the body of the patient on to their own knees, and support him there while No. 4 now removes his hand and pushes the stretcher under the injured person, who is then (by the help of No. 4) lowered carefully and gently upon it.

If only three bearers are at hand the stretcher is placed at the head of the patient in a line with his body. Nos. 2 and 3 take position on the right and No. 1 on the left; Nos. 1 and 2 support the shoulders and body of the patient, grasping each other's hands underneath him, and No. 3 takes charge of the lower limbs, and all three lift the patient, and taking short side-long steps advance the length of the stretcher and carefully lower.

In unloading the same movements are used, of course in reversed sequence, and when there are only three or two bearers the patient is carried by side paces over the head of the stretcher.

CHAPTER V.

THE TRANSPORT OF SICK OR INJURED FOR LONG DISTANCES.

WHEN circumstances necessitate the removal of a number of sick or injured persons for a considerable distance, as, after a battle, or a colliery explosion, or any other disaster affecting numerous persons, it will often become necessary to use such means of conveyance as the district affords either wholly or as supplemental to the approved and perfected ambulance of the service.

If there is no railway conveniently situated, it may be necessary to use the common springless jolting country carts; but these, even if provided with mattresses, or sacks filled with straw, are very distressing to the injured from the constant jarring and shaking to which they are subject. Even if the floor of the cart be well covered with straw or hay, the constant vibration causes it to move and gather into heaps between the bodies of the patients, gradually leaving the helpless sufferer, to find the hard boards and agonising shocks of the rude vehicle.

It is best, if the patient is on a stretcher, to place it with the patient upon it, in the cart ; the floor should be covered to a considerable thickness with hay, straw, sea-weed, shavings, bracken, heather, or other suitable substance.

But far better is it to adopt the mode used by Surgeon-Major C. Smith. In this case one end of a rough pole is lashed to the top side rail of the cart or waggon, outside the side bars ; to the front another is similarly lashed to the rear end of the same rail inside. The same is then done with the topside rail of the other side of the cart or waggon. Cross poles are now lashed to the free ends of the four poles ; and these cross poles support the stretchers containing the wounded, which are firmly lashed thereto.

They thus get the benefit of the spring of the free ends of the poles, and to keep this within proper limits, bands of twigs or ropes are placed loosely round both poles and top rail of the vehicle.*

When a railway is attainable a single patient not very seriously injured may be well conveyed by placing a board across the seats or using the cushions of the other seats, but if more severely hurt, the stretcher should be suspended in the guard's van, or any sufficiently open carriage, taking care to so lash it to the sides as to prevent too great vibration, or the possibility of its swinging so far as to strike the side of the carriage. Here again the hammocks and netting so common about country houses and lawns can be utilised as modes of conveyance, and are very useful and comfortable modes of conveyances if slung from a strong beam, and a support supplied beneath the knees (except of course when there is fracture of the lower limbs not yet reduced), and secured by splints and bandage.

In military practice, the available means of railway conveyance are by second-class carriages and goods waggons ; in the former the distance between the seats is too small to allow the full-sized stretcher previously described to be used, and a special waggon stretcher which is described with the Mark I ambulance waggon (and is shorter than the field stretcher) is used. In these cases two stretchers are placed in each compartment of a second-class carriage.

When goods waggons are available, they, unsuited as they are in their original state, may be rendered fit for the conveyance of considerable numbers of wounded or sick by two principal methods. First. Grund's mode (see Fig. 15). Four springs are fixed in the floor of the carriage ; on these rest two strong poles, and across the poles are placed the stretchers, three to each waggon.

This mode is most suitable when only open lorries are available.

* The military authorities provide padded cross-pieces for the purpose.

The second, the mode introduced by Major-General Zavodovski (see Fig. 16), is adapted for covered waggons, when a larger number

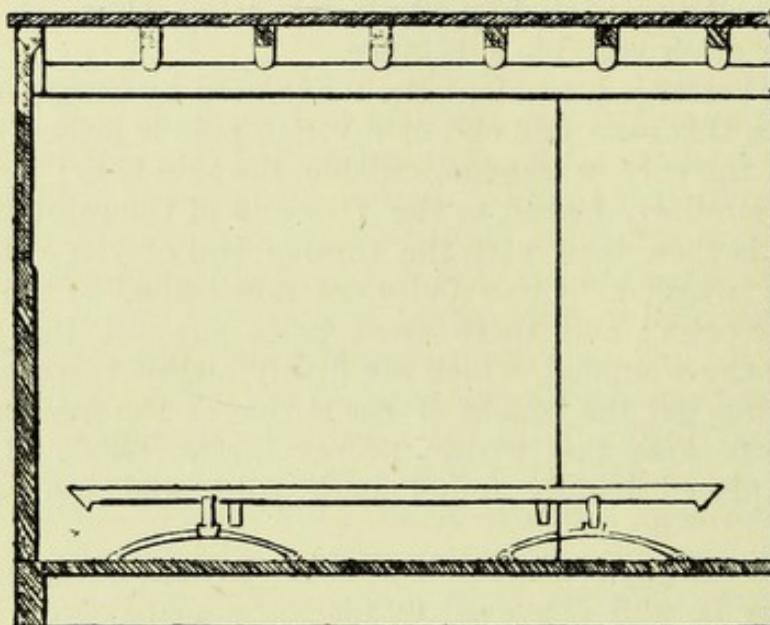


FIG. 15.—LONGITUDINAL SECTION OF PART OF A GOODS WAGGON FITTED ON GRUND'S PLAN.

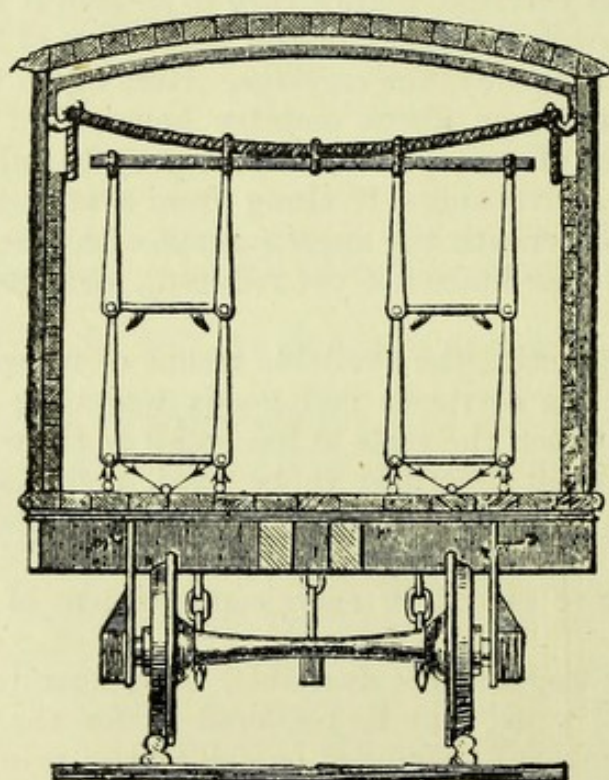


FIG. 16.—TRANSVERSE SECTION OF A GOODS WAGGON FITTED ON ZAVODOVSKI'S PLAN.

can be conveyed, eight stretchers being the complement of one waggon. Two stout cables, an inch in thickness, are suspended across the top of the car, fixed to iron hooks that fasten to iron

rings $2\frac{1}{2}$ in. below the roof. If hooks and rings are not attainable they may be fixed through four holes bored through the sides of the car. To each of the two ropes is attached, at three points, a pole of some firm and elastic wood, about 8 ft. long, $2\frac{1}{2}$ in. thick in the centre, and $1\frac{3}{4}$ in. at the extremities. To the poles thus placed, horizontally, there are attached on each side four strong cords, with knots so arranged that they may support the stretchers in a level position. In order that when the carriage is in motion the stretchers with the patients may not sway backward and forward, the lower tier are fastened by $1\frac{1}{2}$ in. ropes to three small iron hooks screwed into the floor.

The more frequent utilisation of the hammock for moving invalids has been forcibly advocated by Mr. Richard Davey, of Westminster Hospital, and an admirable arrangement, designed by Dr. J. D. Macdonald, F.R.S., R.N., and called an ambulance lift, on the principle already described, has been much used in the embarkation and disembarkation of sick, and is of value also for land carriage. The broad foot piece and the support beneath the hams are so adapted that patients with injuries, even to the lower limbs, may, after a properly applied first dressing, be removed by them. Four hammocks can be slung in an English railway luggage van.

It will not be altogether uninteresting to note the modes of transport employed in some of the more recent wars. Horse litters were used in 1862 in the American war. They are copied from the Indian mode of transport, and are well adapted for frontier service; they may be made for one or two horses. In the former one end is supported by the horse or mule, and the other trails on the ground. When two horses are used they must be trained, and one supports each end. General Jackson, in his wars against the Indians, used the skins of oxen, &c., slung on poles or rifles, for the carriage of his wounded. The Austrians have almost a perfect system of ambulance trains, each conveying 100 wounded, besides surgeons, dressers, stores, &c. In Egypt, says Surgeon Dick, M.B., A.M.S., there was no wheeled transport, and sick and wounded were carried on litters, one on each side of a camel; a sort of a cot with a movable hood like that of a perambulator; when the patient could sit up cacolets were used. These are a sort of chair, and were slung one on each side of a camel; both litters and cacolets are made to fold up when not in use. With regard to these latter, Dr. Appia, who has had great experience, says that the cacolet with rests is very rarely of use even in wounds of the trunk or arm, or even of the foot; but that it is quite impracticable in wounds of the abdomen, in fractures of the thigh, and compound fractures of the leg. Here the litter or cacolet bed has rendered excellent service.

Surgeon Dick goes on to say that at Suakim the Indian dhoolie was used. This is a light cot swung from a long pole, and provided with curtains for shade and carried by four bearers, two in front and two behind. It forms a very good and speedy mode of transport.

It is by no means an unnecessary caution in military service to see that the rifles the bearers may use as stretcher supports shall be unloaded before being put into position. Also those bearers who carry rifles, shall see either that they are unloaded or carefully placed in such a position that they cannot injure the patient should they by any accident explode. On more occasions than one is such an occurrence on record as the fatal shooting of a wounded man by the accidental discharge of the rifle of one of his bearers.

CHAPTER VI.

RAISING AND LIFTING HELPLESS PATIENTS IN AND OUT OF BED.

HAVING at length conveyed our patient in safety to his destination, where, after so many moving adventures, it is to be hoped that he will rest and make a good recovery, it will be well to consider some points of importance with regard to those smaller but still important and frequent movements which are still necessary.

A patient *can be lifted* by two people joining hands under his shoulders and hips; if there is any injury to a limb the part must be supported and attended to by a third person, who shall firmly grasp and steadily support above and below the seat of injury. It is often necessary to move a patient from one bed to another for one of various purposes. When this is the case in hospital the beds may be brought close together, and he may be drawn on the under bed clothes across from one bed to the other, but this is only practicable when the beds are readily movable and of equal height. In military hospitals, where Captain Russell's stretcher is provided, a patient may be lifted by two attendants. This stretcher consist of two poles connected by strips of webbing and two cross-bars. To use it one pole is removed, and the other, with webbing attached, is laid by the side of the patient. The looped ends of the webbing are then passed underneath the sick man, and the pole which was previously removed is passed through the loops; the cross-bars are then put into proper position and the stretcher is ready loaded for removal.

A sort of improvised hammock may be made by tying the under bedclothes (if not sufficiently strong to support the weight

an extra blanket should be placed under the patient, sometimes before the removal is attempted) so as to meet above the body of the patient, and rolling them up until the roll is close to him, when, if firmly grasped by two persons, he will be readily removed for a short distance. With two poles or even two long broom handles, rolled in a similar manner in the under bedclothes, one on each side of the patient, an improvised stretcher is formed by which a patient may be removed and carried even a considerable distance by four persons. They should stand two at each side, facing the patient, and grasp the poles surrounded by the bedclothes, with one hand near the extremity, and with the other near the centre; and the patient should be removed feet foremost over the foot of the bed. It should always be remembered that when patients are weak and have been long in bed they are liable to faint when they assume the erect position, and therefore great care is necessary in removing them. In lifting a patient from a bed the width of the bed and the presence or absence of a footboard, and its height, will prevent us in civil life from having recourse to these methods. In such a case a patient may be removed by two persons standing side by side, the one placing the arms, one under the shoulders and the other under the middle of the back, while the second puts one arm under the lower part of the back and the other under the knees.

A child, a woman, or a very thin light person may often be lifted by one strong bearer, who should pass his arms well under the patient, and be sure that he has a firm hold and is capable of the task before he begins to lift. One arm then supports the broad of the back just below the shoulders, and the other the two knees; also where a patient can sit up he can be carried by one of the improvised seats previously described.

To turn a helpless patient on to his side for any purpose he should lie as straight as possible with his hands straight down by his sides; the attendant then places both arms underneath him, one under the chest and arms, and the other under the hips sufficiently far to bring the hands well round the further side of the patient, and then pulling (as it were) that side towards himself, and slightly raising his arms by the leverage so obtained the patient is turned on to his side. A patient should never be pushed over.

Weakly patients frequently need to be raised in the bed; this may be done by pillows or by a headlift, which may be part of the mechanism of the bed, or a separate construction. In the latter case it is to be pushed under the mattress and is worked by a rack and pinion. When pillows are used a slope should be made by placing them first under the small of the back and rising gradually by additions until the proper height for the head is attained. Care must be taken that they are not so placed as to press the chin

forward upon the chest, which would be irksome and injurious to the patient by obstructing the respiration.

In the use of the bed-pan the mode varies with the kind. If the old-fashioned circular pan is used the patient must be lifted by one of the modes already recounted, and the pan be then placed under him. If the slipper form of bed-pan is the one the patient should be turned on one side and the pan slipped under the buttocks.

CHAPTER VII.

CONCLUDING REMARKS.

I HAVE thus far endeavoured, as briefly and succinctly as lay in my power, to describe the principal methods and devices which have been found by experience to be of value in the removal of wounded or sick persons, and the rules and directions for their useful application. I have endeavoured also to point out the principles which underly these rules, and the objects which are intended to be attained by the various appliances. It has not been my object in this short essay to pass beyond these things, nor to teach or describe the modes of rendering first aid to the injured—these matters are treated very ably and fully in many recent ambulance text books, but the subject of our present study has not received from them the full and complete treatment which, I think, it deserves, and which I have attempted, however inefficiently, to render in this paper.

To my readers I would say a few words before parting. You, the men of my corps, and you ambulance students of wholly civil life, are alike engaged in one of the noblest and most beneficent works that could possibly occupy the minds and employ the faculties of men. To render assistance, valuable, nay, often invaluable, skilled, precious, intelligent, to your fellow-creatures in their darkest hour of agony, to soothe the pain, to relieve the anguish, to succour from the point of danger, and to bring within reach of the resources of science is a work worthy of a god; and though your share may seem to some but humble it partakes of the godlike nature, and gives its own reward in your own good conscience and the indwelling knowledge of duty done and good work achieved, which only it is that makes this life worth living. In the hope that these lines may be of use to you in preparing and fitting you for this your noble task, I place it in your hands and leave it to the judgment of my professional fellow-workers, and to the unerring voice of the public for which it has been written.

APPENDIX.

AN EASY DRILL FOR THREE BEARERS.

NUMBER.—The bearers will number 1, 2, 3. No. 3 should be in command responsible for all dressing and care of the injured part. He should also see that Nos. 1 and 2 break step in marching.

PLACE STRETCHER.—The stretcher is now to be placed in a line with the patient's body, the foot of the stretcher to the head of the patient. The order is then given to

TAKE POST.—Nos. 1 and 2 take post at either side of the patient, and No. 3 at the lower extremities, on the injured side. Nos. 1 and 2 now go down on one knee, and each passing an arm under the patient's shoulders and under his thighs, they clasp hands. No. 3 places both his arms under the legs of the patient ; when all is ready he order is given to

LIFT WOUNDED.—The whole will lift steadily and slowly, and the order given to

CLOSE ON STRETCHER.—The whole take short side paces, carrying the patient head foremost over the foot of the stretcher until his head is over the pillow, when the order is given to

LOWER WOUNDED.—The patient is gently lowered on to the stretcher. Everything is now ready, and the bearers should get into position. No. 1 at the foot of the stretcher, with his back to the patient, and No. 2 at the head of the stretcher, with his face to the patient. The order is then given to

LIFT STRETCHER.—Both bearers bend down and grasp the handles of the stretcher, and they both lift, No. 1 relying on No. 2 saying ready ; or, if he is not ready, saying stand fast. The order is then given to

MARCH.—No. 1 leads off with the *left* foot, No. 2 following with the *right*, No. 3 marching at the side of the stretcher, the same side as the patient's injury. Having reached their destination the order is given to

HALT ! LOWER STRETCHER.—When it must be carefully lowered ; afterwards the bearers stand up and the order is given to

LIFT WOUNDED.—When all three bearers proceed, as before described, to lay hold of the patient and lift him. The order is then given to

CLOSE ON STRETCHER.—The whole take short side paces, carrying the patient head foremost over the head of the stretcher, and he is placed on to the bed or couch prepared for him.

NOTE.—In *lifting* and *lowering* the patient the three bearers must always act slowly, deliberately, and in concert. If not, and especially in fractured limbs, they may make serious complications.

