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COMMON ACCIDENTS

AND

HOW TO TREAT THEM

BY

DR. ANDREW WILSON, F.R.S.E.

AND OTHERS

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PREFACE.

THE spread of ambulance-teaching through all classes of society being now an accomplished fact, the present manual has been designed as a text-book for classes and for private study also. Care has been taken that the directions and instructions given should be of plain and practical nature; while the illustrations, it is hoped, will serve to elucidate and explain various points of importance. In the section on "Bandaging" this latter feature has been specially kept in view.

It may be added that the substance of this work appeared as a series of articles in *Health*, and that each author has duly revised the chapters for which he is responsible. The names of the authors who have contributed the various sections of the work will be found in the table of contents.

ST. MARGARET & ST. JOHN WESTMINSTER
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COMMON ACCIDENTS.

CHAPTER I.

FOREIGN BODIES IN THE EYE, EAR, AND NOSE.

THE delicacy of the eye and the high sensitiveness of its various parts render the presence of any foreign matter within its structures an extremely irritating and painful accident. In addition to the mere fact of pain, which must be relieved, there is also the additional risk of injury being done to the eye itself, and this is more especially the case when chemical substances, corrosives, or specks of iron (or "fire," as they are commonly called) from the anvil of the smith, gain admittance to, or become imbedded in, the eye. Naturally, the first tendency on the part of a person who has received such an injury is to rub the part, and it undoubtedly requires the exercise of a high degree of self-command to overcome the temptation to obtain relief in this way. But a little reflection will at once convince us, that by rubbing the eye under such circumstances we can only increase the injury and mischief we desire to avert. Hence, a primary rule in dealing with all such injuries is *to avoid rubbing the eye.* If the eye is rubbed, not only will a solid body which has gained entrance thereto be liable to become fixed more deeply in the eye-structures, but in the case of, say a particle of lime, the foreign body tends to become broken up, and, by its breakage, to damage the eye more deeply than it would tend to do in its originally single state.

In the case of "fire" in the eye, the safe rule is, that unless the particle of steel can be readily removed, it had better be left for the surgeon. If there is much irritation and pain, and the surgeon's visit is delayed, a little olive oil, or castor oil, dropped into the eye,

may be found soothing. Where the person is far from surgical assistance, seat the patient in a chair and take your stand behind him, draw up the upper eyelid, steady the globe of the eye with the fore and middle finger, and gently remove the foreign body with any convenient instrument, which, it is needless to add, must not be of sharp character. But it is better far, wherever there is a possibility of obtaining medical advice, to oil the eye as above noted, to steady the eye by placing a pad of cotton wool over it when closed, to bandage this pad in its place by a handkerchief, and to take the patient to the surgeon.

The presence in the eye of foreign bodies, however, of a kind which do not necessarily injure the eye-structures, and which are capable of being removed by the exercise of a little coolness and confidence on the part of the ambulance student, gives opportunity for the exercise of knowledge which affords relief to a very acute form of pain. The function of the "tears," as most persons know, is that of washing and lubricating the eye-surface. "Tears" are secreted by the "lachrymal glands," or "tear glands," one of which exists under each upper eyelid, towards the outside of the eye. The "tear duct," or drainage tube of each eye, opens into the corresponding nostril, which therefore receives the tears themselves after they have discharged their function. When a foreign substance irritates the eye, a copious flow of tears takes place in obedience to a natural demand made upon the glands through the agency of the nervous system. In most cases, this flow washes away all dust-particles, and keeps the surface of the eye clear. But where the object is of relatively large size, our active interference may be needed to relieve the sufferer. Thus, an eyelash irritating the globe of the eye, and refusing to quit its position, is an extremely irritating body. In such a case, pull the upper lid forward over the lower lid, which should be pushed up under the upper one, and in this way endeavour to sweep the under side of the upper lid. If this plan should fail, try the effect of opening and shutting the eyes under water, by placing the face in a basin of cold water.

Failing to obtain relief by these expedients, we should evert or turn out the eyelids, and look for the offending particle on the inner surface of each. The lower eyelid can be readily examined in this way, of course, by being pulled down, and its inside surface swept with a camel's-hair pencil moistened in tepid water. The "eversion" or turning out of the upper lid is easily accomplished, but requires a little dexterity. The operation is best effected as

follows :—Stand behind the patient as he sits ; place a towel over his head, which should rest on your chest. Take a penholder, piece of wire, or similar object—not too thick—and press it on the upper eyelid, about half an inch or so above its edge, so as to push the eyelid back. As this is effected, seize the eyelashes of the lid firmly with thumb and forefinger, and lift the lid backwards over the penholder. The under surface can be then examined, and any foreign particle removed, while the surface of the globe can also be scrutinized. A pinch of snuff, causing violent sneezing, is an old-fashioned, and, in many cases, effective remedy for the removal from the eye of small and irritating particles.

The entrance of lime into the eye is a source of great pain and danger. Provided such an accident can be attended to *immediately*, the eye should be well washed out with a solution of vinegar and water—a drachm, or teaspoonful, of vinegar being added to two ounces of water, to make a suitable lotion. The upper lid should be everted, as already described, and all particles of lime removed. Afterwards, a drop of olive oil or castor oil should be placed in the eye, and the eye bandaged with a compress or pad of lint dipped in cold water.

In the case of *acids* injuring the eye, it should be washed out with a soda solution—five grains of bicarbonate of soda being added to the ounce of water—and the after-treament, above noted, with oil and wet compress carried out. Where gunpowder injures the eye —a common accident amongst boys—it is best to syringe the eye with tepid water, so as thoroughly to remove all the particles. The surfaces of the eye-ball should also be carefully examined in such a case, and oil dropped into the eye, as before.

In the case of the *EAR*, foreign bodies, while not so dangerous as in the case of the eye, become sources of mischief, chiefly because of the clumsy efforts, injuring the ear, which are made to extract them. Bear in mind that the canal of the ear ends like a street without an opening—it is, in other words, a *cul de sac*. At the end of the ear-passage, or canal, the drum-membrane exists, and closes the passage. On the other side of this membrane, the *Eustachian tube* leads into the mouth. A primary caution in dealing with the ear, under all circumstances, is that of avoiding any irritation of the drum-membrane just noted. Thickening of this membrane, due to the irritation of soap, hard towelling, etc., is a frequent cause of deafness. The idea that insects can penetrate

through the ear into the head is thus seen to be absurd. If any insect does gain admittance to the ear-canal, it should simply be drowned by pouring olive oil into the ear, if it cannot be instantly extracted. Irritation of the drum of the ear may cause inflammation of that membrane, or, what is far more serious, of the internal ear itself. I have known a case in which deafness ensued for weeks, through the point of a lead-pencil having been pushed through the "drum-head" of the ear; the patient, in this case, having foolishly put the pencil into the ear to counteract some tickling or irritation which existed.

If a body, such as a pea, bead, or small stone, should gain admission to the ear—an occurrence not uncommon in the case of children—it is better to send at once for a medical man, if he is within reasonable distance. If you have to rely on your own efforts, bear in mind that the less the ear is irritated by frequent attempts at removal, the better for the patient; and that, in all cases, it is gentleness and dexterity, not force, which is required. Of course, if a fine pair of forceps—a little instrument which with advantage should be found in every household—is at hand, these should be carefully used. A fine wire, with the tip slightly bent, so as to form a hook, might be employed in lieu of any better appliance. The bent point of a Waverley pen has been ingeniously recommended for this purpose. In each case, pass the hook *above* the pea or bead, so that the hook will pull the object out when traction is made upon it. Another plan is that of carefully directing a stream of tepid water from a syringe *along the roof* of the ear-passage, in the hope of washing the offending body out; but such syringing, in all cases, must be carefully carried out, and without undue force.

A foreign body *in the nostril* is often removed by violent sneezing; or by blowing the nose forcibly, while the sound nostril is closed by the hand, may suffice. When these means do not relieve the patient, the use of the forceps may be recommended. A current of water injected up the opposite nostril to that affected will return by the blocked-up passage, and thus eject the obstacle, provided the patient will keep the mouth open. A syphon-tube can be used here. This tube has its short arm inserted in a jug of salt and water (pure water is very irritating to the nose), which is placed in an elevated position, while the other end of the tube is placed in the opposite nostril, as directed above. The force of the current depends on the height to which the jug is raised.

CHAPTER II.

WHAT TO DO IN A CASE OF CHOKING.

On the principle that success in rendering assistance to those who are in distress can only be obtained through the possession of, at least, an elementary knowledge of the anatomy of the parts which are injured, we require, in the case of *choking*, to know something of the anatomy of the mouth, throat, windpipe, and related parts. By a reference to Fig. 1, the chief points concerned in this common accident may be readily appreciated. The mouth opens behind into a cavity called the *pharynx*, which is a large cavity communicating with the nose, the mouth, the windpipe, and the gullet, and lying in front of the spine. The *uvula*, in the centre of the *soft palate*, is shown at 4, and the opening of the *Eustachian tube*, which leads into the mouth from the inner side of the "drum" of the ear, at 3. From the pharynx two tubes or pathways open. There is, first, the *trachea* or *windpipe* (11), which has the *larynx*, or organ of voice (7, 8), at its upper extremity. The windpipe, as its name indicates, leads to the lungs, and it is obstruction of this tube by any foreign body which constitutes the real and essential danger of "choking." "Adam's apple" forms the front boundary of the organ of voice.

The entrance to the windpipe, it should next be noted, is guarded by a little lid called the *epiglottis* (6). The function or use of this lid will be presently alluded to. The *vocal cords*, by the vibration of which voice is produced, are figured at 10. Behind the windpipe, and lying in front of the spine (the *vertebræ* or separate bones of which are shown in the figure) we find the *gullet* (12), which is, of course, the pathway of the food to the stomach.

The study of what occurs in the ordinary act of swallowing our food is also a necessary preliminary to the understanding of the nature of choking. Thus, when the tongue has collected the particles of food, and moulded them into a bolus, it passes the morsel backwards into the pharynx. So far, swallowing is an act of purely voluntary nature. Then, it would appear, the larynx, or organ of voice, is raised, and, with the pharynx itself, is carried forwards, so as to be brought under the base of the tongue. The *epiglottis*, or lid (6), is now brought into play, and closes over the

opening of the windpipe, so as to protect that tube against the entrance of the food, while the opening itself is made to close through the action of its appropriate muscles. The hinder openings of the nostrils (into the mouth) are then separated from the

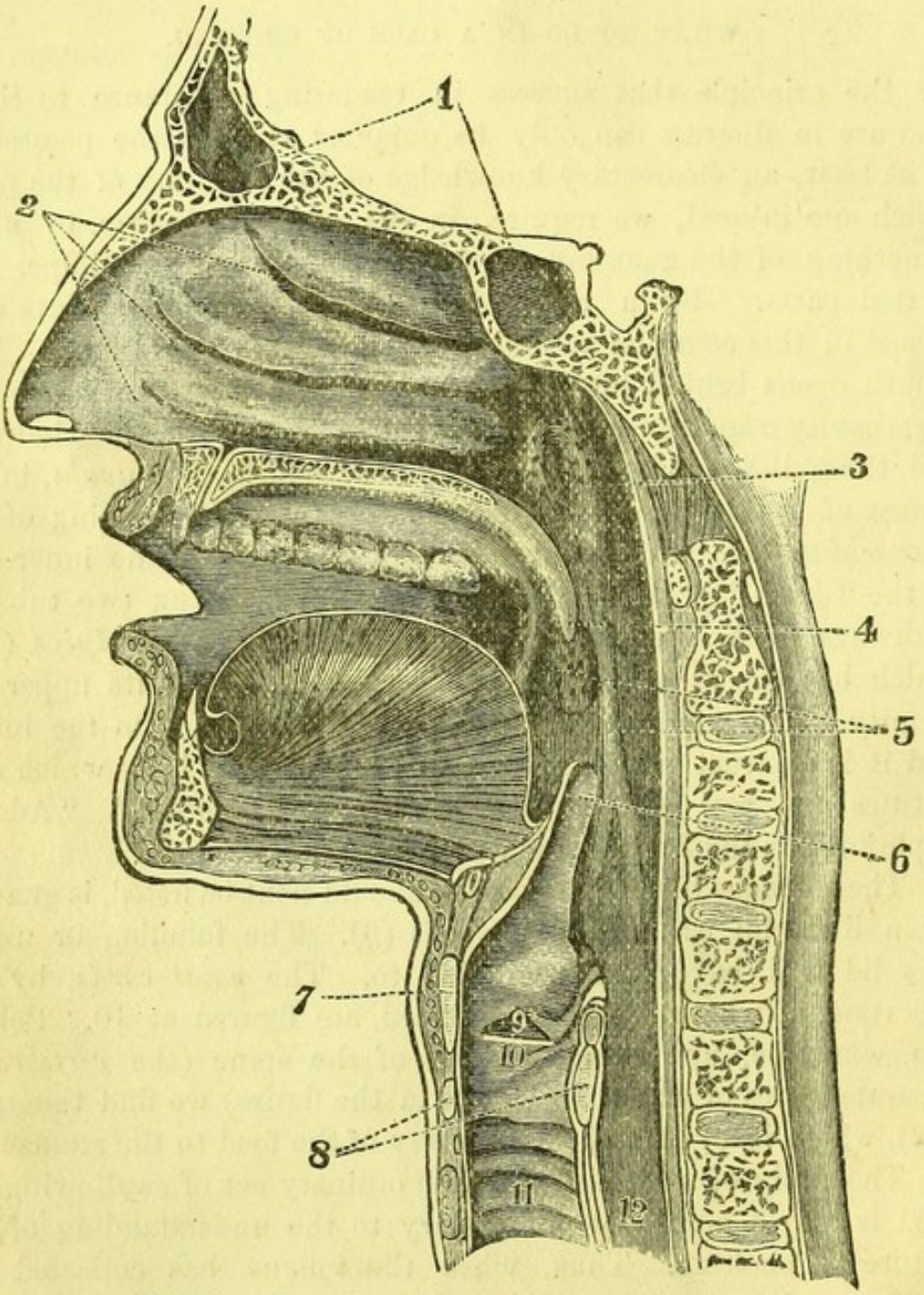

Fig. 1.—Vertical Section of Face and Neck.

pharynx by the approximation of the soft palate to its hinder wall and the drawing together of its two sides (pillars of the fauces) (5), and the food, at first received into the pharynx, and passed over the epiglottis guarding the windpipe, is thus at last

landed in the gullet itself. Received into this tube, the food is propelled downwards by the involuntary muscular contractions of the gullet; so that it matters not whether we stand on our head or our heels, the food is passed in the latter stage of swallowing onwards to the stomach by the involuntary action of the muscles. In vomiting in man, and in the act of "rumination" or "chewing the cud" in some of the lower animals, the ordinary action of the gullet-muscles in swallowing becomes reversed.

Choking is, therefore, an accident which is liable to arise through any cause which serves to keep the aperture of the windpipe unguarded and open while swallowing is being performed. Thus, choking is most likely to happen when a person speaks, coughs, or even sneezes during the act of swallowing food; and this fact is especially seen in children who are "chatterboxes," and who will persist in talking in all the vivacity of childhood at meals. We should not in the first place, however confuse with "choking" the accident wherein substances tend to become fixed in the gullet (12) itself. A fish-bone or other substance in the gullet, as may readily be seen, is not dangerous, in the sense in which a foreign body in the windpipe threatens to obstruct breathing and to end life. Hence, the treatment of an object which has become impacted in the gullet—or "throat," popularly so-called—is different from that required to afford relief in a true case of choking. Water rapidly gulped down, or a hard crust of bread swallowed with water, will often suffice to loosen fishbones, etc., which have lodged in the gullet. Failing to obtain relief by such measures, make the patient vomit. Ejection of the contents of the stomach will frequently loosen and bring up a body in the gullet which resists all attempts to force it from the mouth. If the obstacle cannot be removed by such simple means, the surgeon's attendance will be necessary. He may then endeavour to push the morsel downwards by means of a probang or the tube of a stomach-pump. It should be borne in mind that objects such as pins, wire, money, etc., should never be pushed downwards, but should be extracted by aid of special instruments (*e.g.* the "horse-hair probang" or "money probang") with which the surgeon will be provided.

True "choking," as we have seen, means obstruction of the air-passages leading to the lungs. A person swallowing a piece of tough gristly meat may thus be "choked" by the morsel blocking up the windpipe. False teeth are frequent causes of this accident,

while coins and other objects may similarly (and especially in young children, to whom they are given by adults lacking common sense) produce serious or even fatal accidents in this way. When a person "chokes," the old-fashioned remedy of a blow on the back, between the shoulder-blades, while the person bends forward, is often effectual. This failing, in the case of a child there can be no objection to hold it up by the heels for a second or two, and to use force to the back as before.

But if these means fail, and the case is momentarily becoming more and more serious, the patient—child or adult—should at once be laid in a reclining position. The mouth is then to be opened, and a gag of some kind (a rolled-up handkerchief, a piece of wood, or other object will serve) is to be placed between the teeth, so as to keep the mouth open. The forefinger alone (or that finger and the thumb) is to be inserted into the mouth, and made to sweep round the root of the tongue and pharynx, in the hope of reaching the foreign body, and of sweeping it into and from the mouth. The knowledge that, in very many cases of choking, the obstacle is to be found fixed, not down in the windpipe, but at the root of the tongue, or between the root of the tongue and the epiglottis (6), must be borne in mind; since it is clear that in such a case the forefinger acts as a handy hook and instrument by which the obstacle can be removed.

If, after the extraction of the foreign body, the patient is found to be insensible, and his breathing to have ceased, we must resort to *artificial respiration* (to be fully described in a future chapter), while a surgeon will, of course, have meanwhile been sent for. It is well to bear in mind also, that, in sending for a medical man, the nature of the injury should be made known to him, that he may bring with him whatever instruments are needed for the treatment of the case.

In a case in which the morsel of food or other body has passed into the windpipe or its branches (the *bronchi*), giving rise to cough, pain at the seat of the obstruction, etc., the patient will be found to swallow water readily (showing that the obstruction is *not* in the gullet), while in breathing out there is great pain and difficulty. Here no time must be lost in sending for medical aid. Before the doctor comes, the patient's position should be studied, with the view of discovering whether or not he can breathe more easily in one position (*e.g.*, on his side or back, or on one side more easily than on the other) than in another.

If death should seem to be imminent in a case of choking, where the obstruction lies in the larynx, or where it lies above the organ of voice, and the patient is far from medical aid, the last resort of the bystander must consist in performing an operation, which is in itself simple, but which naturally requires coolness of mind and firmness of hand. A horizontal cut, half an inch long, is to be made with a sharp penknife, on a horizontal groove which will easily be felt, about one inch below the most prominent part of Adam's apple. The knife is then to be passed into this groove for a similar distance, until it is clear from the rushing in and out of air that the windpipe is open. The edges of the cut in the windpipe must then be kept apart by putting into it a quill or tube of some kind, through which the patient can breathe, and which must be held in position till the surgeon comes. If blood is coughed up through the tube it must at once be mopped up with a sponge, and so prevented from being sucked back into the windpipe. After all bleeding has stopped, a flannel or sponge, wrung out of hot water, is to be placed over the throat, and, if possible, the patient kept in a moist steam atmosphere.

Naturally this procedure is one which the ambulance student would shrink from performing, but, as a "last resort" in emergency, if the person seem to be at the point of death, and if medical assistance (as, for example, on board many ships) cannot be obtained, its nature should be borne in mind. It is not adapted for accidents in children, nor, of course, can it be of service where the foreign body lies in the windpipe itself, or in the branches (or *bronchi*) leading to the lungs.

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CHAPTER III.

SUNSTROKE—FROSTBITE—BURNS AND SCALDS.

"SUNSTROKE," or "heat-stroke," as it is perhaps more correctly termed, may occur not only during the day but may happen at night. Its cause may be referred to the irritation produced in the *medulla* (or top of the spinal cord, where that great nervous axis becomes continuous with the brain), this irritation being dispersed through the frame, and affecting the organ of mind itself. The loss of consciousness which commonly occurs in sunstroke may be replaced, as it is usually followed by stupor and giddiness, while the

nervous effects, which often persist for long periods after the injury, render this accident one which it is most desirable to avert, or, when it happens, to treat skilfully and promptly.

The *prevention* of sunstroke may be first glanced at. Thus, the nape of the neck is, in particular, to be protected against the rays of the sun. The country labourer's practice, when in the harvest-field, of protecting this part of his body by a cool cabbage-leaf, is founded upon the teachings of experience, and the flap of the helmet, or hat used abroad, to protect the neck, is seen to be a thoroughly necessary addition to the head-gear of tropical climates. When sunstroke does occur, the patient should have his clothing at once removed. He should next be placed in the flat position, his head and shoulders being slightly raised. Then cold water must be poured on his head and down his spine from a height of three or four feet. The hands, feet, and chest should also be sponged with cold water. If an ice-bag is at hand, apply this to the head. Remove the patient to a cool room, which should be darkened. If signs of collapse come on, apply a mustard poultice to the neck.

In the case of a person who has been *frostbitten*, the grave error of bringing him at once into a warm room, or of placing him in front of a fire, is often committed. No practice can be more hurtful or injurious than this. The evil effects of such a procedure are seen, in a mild way, in the production of chilblains in cases where cold and chilled hands are held near a fire, in place of having their circulation restored by brisk friction. The aim of all treatment in frostbite is to restore the circulation *very gradually*, so as to avoid congestion and mortification of the frostbitten parts. In such a case, therefore, the patient must not be taken into a warm room, but kept in a cold place. The parts are then to be rubbed with snow, or to be bathed with ice-cold water, while pieces of linen soaked in such water may also be laid on the injured surfaces. In this way the circulation can be gradually brought to its normal condition. After a time, and when the patient is recovering, a little warm coffee or cold brandy and water may be given him.

Burns and scalds form injuries which present excellent opportunities for first aid being given, because much may be done both to relieve pain and to assist the process of healing when the accident is promptly treated. Very varying degrees of injury are seen in the case of burns, while a serious accident of this kind becomes a matter for anxiety, not merely on account of the actual injury itself, but also on account of the shock which inevitably follows. When a

burn or scald has been inflicted, our first care is that of removing expeditiously and promptly, *but with great care,* the coverings of the injured part. No time should be lost in discharging this duty. The clothes should be cut off as near to the burn as possible, but on no account should any covering which has become fixed be torn or stripped off the burn itself.

Then the burned part should be immersed in *warm* water of the temperature of the body itself (about 100° F.). If blisters have formed, the fluid should, as a rule, be let out. The dressing, which should meanwhile be prepared, consists of oil of any kind—olive, linseed, salad, cod-liver oil—no mineral oil, such as paraffin, should ever be used as an application to a burn. The best dressing for a burn is *Carron oil*, which is a mixture of equal parts of linseed oil and lime-water. Into this (or the plain oil, where Carron oil is not at hand), strips of lint or rags are to be dipped and saturated with the composition and applied to the burned part. The dressing will consist of cotton wool or flannel, and a bandage. The patient is to be made comfortable in bed or on a couch, pending the arrival of the surgeon.

Where the burn or scald has been a severe and extensive one, the shock to the system which follows must be treated by wrapping the patient in a blanket, and by giving him stimulants. It should be borne in mind that in such a case the patient is really suffering from cold and collapse, and has to be protected against the consequences of the lowering of his temperature which has ensued. If medical assistance is not forthcoming in due time, and the pain is very severe, an opiate of some kind must be given.

Where oil is not at hand, what, it may be asked, should be done in the case of a burn or scald? Such substances as flour, whiting, or chalk, made into a thick paste with water, should at once be applied to the injured part. For the severe pain, it may also be remembered, a strong solution of carbonate of soda in water is a capital application. If near a druggist's shop, the Collodion Flexile of the Pharmacopœia should be obtained, and painted on the surface with a large brush.

The principles to be observed in treating a burn are thus three in number: 1. To avoid tearing the clothes off the burn. 2. To exclude the air from the burned surface. 3. To guard the patient against shock and collapse.

Children occasionally attempt to drink boiling water from the spout of a kettle, and, in consequence, sustain severe injuries. In

such an event, suffocation from swelling of the throat is liable to occur. The doctor ought to be sent for at once. Meanwhile, the child should be wrapped in a blanket, and studiously guarded against the effects of the shock to the system; while, in the endeavour to allay the swelling and irritation, sponges or flannels dipped in hot water should be kept to the throat.

Dr. Voigt, in a recent number of the *Lancet*, has the following valuable hints on a form of dressing which he has found extremely useful in the treatment of burns and scalds. In two cases, this dressing at once removed the disagreeable odour, etc., which often attends burns exhibiting a lack of healing power. The advantage of this dressing is that it can be left undisturbed for a number (four or five) of days. "A dressing which throws a constant antiseptic steam into the wound can be readily prepared. Plain ordinary gauze, unimpregnated with any other antiseptic material, can be kept (till required for use) soaking in pure eucalyptus oil. Before being put on the wound (or burn) which is to be dressed, strips of this eucalyptus gauze are squeezed as dry as possible and then steeped in eucalyptus and olive oil (1 in 5). Thus prepared, the strips of gauze are put on the wound, and immediately over them are applied some folds of ordinary absorbent cotton-wool, which have been freshly wrung out of the pure eucalyptus oil. The thickness of this dressing can be made to vary with the amount of discharge expected from the wound, and, if thought necessary, some dry antiseptic absorbent dressing material can be put outside this moist eucalyptus dressing. The wool, impregnated with eucalyptus, however, very soon dries at the temperature of the body, and its power as an absorbing dressing is higher than one would at first suppose. The deep dressing may be as above described, or may consist of gauze strips steeped in a solution of eucalyptus oil in rectified spirit (1 in 8). In twenty cases treated in Professor Busch's wards (Bonn), the pure undiluted oil was applied directly on wounded surfaces without causing the least pain, even in children."

I should like to add that a very handy application for burns and scalds, as well as for ordinary abrasions, is found in the "Chrisma" of Messrs. Allen and Hanbury, which is a pure product derived from crude petroleum, devoid of smell and taste, and possessing the valuable property of never becoming rancid. A friend has also called my attention to "Quebascho" (a South American bark), of which a pure extract is manufactured by Messrs. Brown, of Farringdon-road, London. This fluid applied on lint, I am

informed, has marvellous properties of relieving the pain of burns and other wounds, and of promoting healing action.

The accident of scalded throat is of such common occurrence in children, and its prompt treatment is often of such importance, that the following note regarding the means for alleviating the dangers of this condition will form a welcome addition to the list of ambulance experiments. The note in question appeared in the *Practitioner*, and is from the pen of Mr. H. D. Palmer, M.R.C.S.

"So many little children die annually, especially amongst the poor, from drinking from the spout of a boiling tea-kettle, that a simple plan of treatment, which saved the life of a little child under my care a short time back, is perhaps worthy of record.

"I was sent for to see Alice B., aged three, who when the mother was out of the room had attempted to drink from the spout of a boiling tea-kettle, which stood on a low fire-place about level with its face. She had succeeded in taking enough into her mouth to scald the throat most severely, and when I got to the house I found the little patient collapsed, livid in the face, and evidently dying from the shock. The mouth was so swollen and scalded I could form no idea as to the extent of the injury to the throat. I thought the child would not recover, but determined, as it could not take food of any sort, to give it equal parts of cod-liver oil and lime water, as much for the sake of a dressing to the injured parts as for the nourishment the oil would afford. I ordered it to be fed with a teaspoonful every hour, and from the first the beneficial effects were truly marvellous, the pain was evidently relieved by keeping the scalded surface constantly coated with this nove Carron oil, and as the child at first only swallowed with difficulty it was longer in contact with the inflamed mucous membrane. In three days the child began to take notice, and in about a week afterwards all the distressing symptoms of difficulty of breathing, which had made me fear for its life at times, had vanished. As it improved I added milk to its diet and gradually reduced the oil and lime water. It recovered completely."

This hint regarding the treatment of such cases should not be lost sight of, by ambulance students especially.

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CHAPTER IV.

POISONED WOUNDS: BITES AND STINGS.

When a person scratches the finger with a rusty nail or a dirty needle, or some such object, the sequence of events which follow such an injury are well known. After a time, the finger begins to throb, or pulsate; pain is felt, and symptoms of inflammation appear; the arm itself may become painful, and the lymphatic glands of the arm-pit swollen and tender; while suppuration occurs in the finger itself. The history of a suppurating finger is, in short, the history of a "poisoned wound." It is the same when a physician wounds his finger in making a post-mortem examination in a case in which poisonous material is liable to be introduced into the system. When a "mad" dog bites a person, the wound inflicted is a poisoned one; and when a serpent "stings," and injects the poison-secretion of its glands into the wound made by the hollow tooth, or "fang," the same phenomena are witnessed. If differences exist in these cases, as they undoubtedly do, they are only differences of degree, after all. One poisoned wound differs from another largely in the rapidity with which the poison acts on the body, and in the nature of the symptoms it induces.

In the case of certain poisonous principles, which act as the cause of illness in the case of wounds, deleterious matters are received directly into the blood. Thus the rapidity of the action of serpent-poison can only be explained on the knowledge that the blood is directly affected by the introduction of the poison or virus. On the other hand, it is probable that many poisons—such as those of the dissection wound or of the rusty nail—act more or less directly and more slowly through the *lymphatic* or *absorbent* system of vessels. These vessels are thin-walled tubes, branching everywhere throughout the body, and devoted to the work of taking back to the blood the surplus fluid (or *lymph*) which has exuded from the minute vessels in the act of nourishing the tissues at large. It thus seems that the rapidity or non-rapidity of a poison, as regards its action on the system, largely depends on the manner of its absorption by the blood or by the lymphatic vessels respectively.

The *treatment* of poisoned wounds presents, in the first place,

certain well-defined principles, which the ambulance student would do well to bear in mind. Thus, in the first instance, the primary indication for treatment is that which teaches us to *take measures to prevent the spread of poison through the body.* This is accomplished (1) by destroying the poison at the wound or seat of injury by cutting out the part (excision); (2) by the action of caustics, etc. (the actual cautery or red-hot iron, live coal, acids, or caustic, *e.g.* nitrate of silver, etc.); (3) by tying a ligature tightly between the wound and the body or heart, so as to prevent the diffusion of the poison; and (4) by sucking the wound so as to extract the poison. In relation to this latter remark, it may be borne in mind that poisonous matters which act on the body, through their introduction directly into the blood, as already noted, do not cause injury when swallowed and digested—always provided, of course, that the mucous membrane of the mouth, etc., is intact, and presents no crack or fissure through which the poison could gain admittance to the blood. Hence, a person whose mouth is intact, may with impunity suck the bite of a mad dog, and thus extract the virus from the wound. Such cases have actually occurred, and have been successfully treated in this manner.

When a scratch with a rusty nail or similar object, or a cut with a knife on which poisonous matter has been known to exist, has been inflicted, our first care should therefore be *to suck the wound*, and *to encourage bleeding.* A wound of this description allowed to bleed freely, will often give no further trouble, and heal quickly like an ordinary clean cut. Where the poison is of a character which may be calculated to produce suppuration, the additional precaution of cauterizing the wound with caustic (nitrate of silver) may be taken. In simple cases, washing the wound with a solution of "Sanitas," of carbolic acid, or of Condy's Fluid, will suffice to destroy any infective material which may exist; this precaution being taken in addition to the foregoing advice to cause free bleeding and to suck the wound.

The cases of the *stings of wasps and bees* are to be treated by extracting the sting, which can usually be seen in the wound, and by applying ammonia in solution to the injured part. The juice of a raw onion applied to the sting has been highly recommended as a means of relieving pain and reducing swelling. These stings only become really dangerous when they occur in the throat. In such a case they are apt to cause choking from the swelling which

ensues. Send for a doctor at once on the occurrence of such an accident, and, until he arrives, keep the patient's throat well steamed with the vapour of hot water. If serious symptoms ensue, we must act as already described in the case of choking.

The case of a *serpent-bite* demands the exercise of more vigorous measures. The only poisonous serpent which exists in Great Britain is the adder, or viper; and the bite of this serpent is not necessarily fatal, except in the case of weakly persons or children. Many foreign species of snakes inflict bites which, in the majority of cases, are fatal in their effects. The rule in all such accidents is that of destroying the poison at once, by a red-hot iron or live coal placed on the wound—a procedure by no means so painful as commonly supposed. Failing these measures, the part should be cut out or excised. The choice, it must be borne in mind, is one between certain death and a chance of recovery by such treatment. Sportsmen in India, when bitten by snakes, have cauterized the wound by burning it with a fusee or by putting a little gunpowder upon it and by exploding the powder, this process serving to destroy the poison rapidly in the absence of other measures. A tight ligature is to be applied between the wound and the heart; bleeding is to be encouraged; and, in the case of snake-bite from a dangerous serpent, stimulants are to be administered in large quantity. Brandy or whisky is to be freely given, so as to enable the patient, if possible, to resist the depressing effects of the poison on the system.

Various expedients, it should be mentioned, have been proposed for the chemical treatment of snake-bite, but as the poison of one snake differs from that of another species in its effects on the system, it would seem that the hope of finding any specific cure or actual antidote is very remote.

The *bite of a rabid dog* is to be treated essentially on the same principle as the bite of a snake—tying a ligature between the wound and the heart, cauterizing the wound, or excising it, encouraging bleeding, washing the wounded surface with douches of hot or cold water, and sucking the wound, as already advised.

There are, however, one or two points regarding the case of the "mad dog" bite which deserve special attention on the part of the public. In the first place, it should be borne in mind that "rabies" in the dog is a comparatively rare disease. Many dogs said to be "rabid" are not "mad" at all, but are simply either in ill-health, or have been excited to bite by being teased or worried.

Secondly, if a dog bites a person, *let the wound be treated as if it were the bite of a rabid animal, but take care to see that the dog is duly secured, tied up, and carefully watched.* In a few days, the dog's true state may be duly noted, and much pain, terror, and mental worry will be saved the patient by the dog, which was supposed to be "mad," being discovered to have been merely excited. It is needless to remark that the bite of a healthy dog carries with it no special elements of danger. If a dog reputed to be "mad" is destroyed, the person who has been bitten is liable to remain under the impression that he may at any time develop hydrophobia. By carefully watching the animal for some days, and by noting whether or not it develops symptoms of "rabies," the mind will at least be assured on the point; care having been taken to treat the bite *in all cases*, as if it were a dangerous injury.

A "mad" dog exhibits a depraved appetite, swallows all kinds of objects, bites at imaginary things, has a copious flow of saliva, spasms of his jaw-muscles, and shows signs of fear and trembling without cause. On post-mortem examination, the stomach is found to be filled with a variety of matters, the result of the depravity of appetite. But it is well to bear in mind that many dogs reputed "mad" have not been so afflicted in any sense. There is no disorder regarding which the public require to be taught plain facts so urgently as that of hydrophobia. Many a healthy dog, biting naturally from being tormented, has been called "mad," has been killed mercilessly and cruelly, and the patient tormented needlessly in consequence, by the idea of a supposed future attack of hydrophobia.

CHAPTER V.

UNCONSCIOUSNESS AND THE TREATMENT OF FITS.

A MAN is found unconscious and insensible by the wayside; or he suddenly loses consciousness and falls helpless in the street. In such a case the ambulance student has first to address to himself the question, "What is the cause of insensibility?" seeing that his treatment of the patient will be guided, as a matter of course, by the symptoms exhibited. Loss of consciousness, it should be noted, may be due to one or more causes out of a considerable number, and we must endeavour to ascertain the exact nature of

the injury (or it may be of the disease) from which the subject of our attentions is suffering. It is not always an easy task to "diagnose" or discover the cause of insensibility in the patient to whom we have been called. Even trained medical men may sometimes hesitate before pronouncing a decided opinion regarding the nature of the ailment or affection which produces the loss of consciousness. But there are certain general rules for treatment, which, when we are in any doubt, may be safely followed, and the ambulance student may, therefore, be able to do much to relieve the patient, to make him comfortable before the doctor arrives, or to restore sensibility, if the case should prove to be of simple character.

Allied to the question of the loss of consciousness is the subject of "fits." These ailments are, as often as not, followed by insensibility; so that the treatment of the latter condition naturally merges into the rules for the relief of "fits" themselves.

Loss of consciousness and a state of insensibility, we may firstly note, may be due to one or other of the following causes: (1) Drunkenness and the stupor of alcoholic poisoning; (2) an ordinary fainting fit; (3) an epileptic fit; (4) an apoplectic fit; (5) uræmic poisoning, or that arising from kidney disease; (6) injury to or concussion of the head and brain; (7) narcotic poisoning, as by opium, etc. It is clear that the discovery of the exact cause of the insensibility may, therefore, be a difficult task, but it is one in the exercise of which we are guided by certain simple rules, tolerably easy of remembrance. To the list of "fits" must also be added the "hysterical" fit, which, if only from the simplicity of treatment, deserves mention at the hands of the ambulance instructor.

A primary rule, but one which, in my experience, needs to be over and over again impressed upon the public and police alike, is that an insensible man, *unconscious from whatever cause,* is to be treated carefully and gently, and is a subject in no case whatever for the police-cell, but for the hospital. If the unconscious man is taken to a police-station, as the nearest accessible place of relief, under wise regulations, a surgeon should be called in at once. The police have occasionally acted in a highly reprehensible manner in cases of insensibility to which they have been called. The phrase "Drunk or dying" is one too often seen as the heading of a sensational paragraph in the public newspapers, describing how a man, conveyed insensible to the police-station, is charged with drunkenness, placed in a cell, and, when visited later on, is found

to be dying, or even dead. Post-mortem examination in these cases usually reveals apoplexy or other ailment as the cause of death. Here the police defence has been that the man smelt of liquor, and that his appearance was suggestive of a debauch. But when we reflect that a man who had taken an overdose of alcohol might, on reeling out of the public-house, be seized with apoplexy—a not uncommon occurrence in drunkards—we may readily enough see why the mere smell of liquor, apart from any other symptoms, is no warrant whatever, for treating a man as an unconscious sot. Even were the man unconscious from drink alone, he is still a subject for the doctor, and not for the police. Alcoholic insensibility is a grave condition. It is, in fact, one of poisoning, and requires to be treated as such. Therefore, the rule that the insensible man is, in all cases, a subject for the doctor's care should be made an inviolate regulation in the work both of the police and of all other persons who come in contact with such accidents. Much blame, misery, and regret would be saved were this rule made, as it is in all ambulance instruction, a fixed and unalterable regulation.

It is well to add here two cautions in dealing with cases of insensibility—namely, that *no fluids are to be given by the mouth in any case of insensibility*; and, secondly, that the exact position and surroundings of the patient should be clearly noted when we are first called to render aid. In instances involving injury and serious assault, we may be able, through such observations, to afford assistance in unravelling the nature of the case. Disordered dress, a broken watch-guard, bruises on the face and so forth, might, for instance, lead us to strongly suspect assault and robbery, and cause us to examine the head at once for traces of brain-injury.

The signs of (1) *drunkenness which has produced unconsciousness* are, firstly, the strong odour of drink exhaled from the patient's lungs and body generally; the face is bloated as a rule, while the complexion itself is pale; the pulse is weak; breathing is slow and feeble, and is often of a "stertorous" or snoring character; while the pupils are generally dilated, but may be contracted or even unequal. Apoplexy (to be presently noted) is very apt to be mistaken for this condition. Loosen all the neck-clothing in the first instance, and make the patient comfortable. If medical aid is not at hand, and the patient seems in danger of sinking, in a case of insensibility from drunkenness, vomiting should be induced to clear the stomach, while, as the patient is in a state of collapse, heat is to be applied outwardly and inwardly.

The (2) *ordinary fainting fit*, which, as a rule, is not by any means a serious matter, is nevertheless calculated to cause alarm, more especially when the fit occurs in a church or other crowded assembly, and where the patient has to be carried out of the building and treated promptly. The causes of the ordinary faint (or *syncope*, as it is medically termed) are fright, or other violent mental emotion, heat, digestive disturbance affecting the heart's action, the sight of blood or of accidents, and, it must be added, tight-lacing. Apropos of tight-lacing and its treatment, there is an incident related in a well-known essay by the late Dr. John Brown, of the canny church beadle in the north, who provided himself with a clasp-knife, and prepared himself, at the doctor's command, to cut the stay-laces of fainting maidens, with the inquiry, "Doctor, will I rip her up noo?"

The beadle's mode of procedure, in reality, gives the clue to the treatment of the fainting fit, and it should be borne in mind that *a safe rule to be followed in all cases of insensibility, is that of loosening all the neck-clothing, and of removing all tight clothing likely to impede the free play of the chest. The mouth should also be examined in cases of insensibility*, so as to make certain that no impediment to breathing exists. A case of choking might result in speedy loss of consciousness, and only the examination of the mouth might reveal the true cause of the accident.

The symptoms of the ordinary fainting fit are easily distinguished. The face is pale and the skin cold; even the lips seem pallid and bloodless; the pulse is very feeble, and insensibility rapidly supervenes. Now, the cause, direct or indirect, of the fit is slight temporary failure of the heart's action. The feeble pulse shows this latter character. Hence, as the heart is performing its work with difficulty, and as the brain is not receiving its due supply of blood, all our efforts must be directed to aiding the heart's action. The common method of treating a fainting fit is to set the person *bolt upright. This is a grievous mistake.* In some cases, lives have been sacrificed to this error. In persons with affected hearts, fatal syncope may occur by the sudden placing of the body in the erect posture; whereas, by laying them flat, and by keeping the head low, recovery is promoted.

In a case of fainting, therefore, carry the patient at once into the fresh air and lay him flat, so as to assist the heart's action, and so as to give it less work to do in circulating the blood. *Loosen all neck-clothing*, as already indicated. If a tendency to fainting is

experienced, the person should bend the head down between the knees. If a person is somewhat subject to such attacks, and if the faintness occurs in church or elsewhere, let him drop his handkerchief on the ground. The act of bending low to pick it up succeeds in allowing the blood to flow to the head without attracting undue notice. Smelling-salts may be applied to the nose to aid in the recovery. Burnt feathers form an old-fashioned remedy, on account, presumably, of the irritating nature of their fumes. Cold water may be applied to the face, and, where recovery is long-delayed, a dash of cold water applied cautiously to the chest may be of service. A little brandy may be given after recovery, if the patient feels much exhausted. Quiet and rest for an hour or two afterwards should be enjoined.

(3) The case of a person who falls down in the street, or elsewhere, in a fit of what is popularly termed "convulsions," is doubtless an alarming occurrence, as far as the symptoms and appearance of the patient are concerned. But, in reality, the case is not so alarming as it looks, and the treatment is of the simplest possible character The "convulsions," commonly so called, of the adult constitute the *epileptic fit* of the physician. *Epilepsy*—to be carefully distinguished from *apoplexy*—is a nervous disease, often bequeathed from parent to child, and inherent in the frame, so to speak. The epileptic patient is a subject for constant medical treatment. He is, even more so, a subject for the most careful personal regulation of his food, habits, and all circumstances of his life. Hence, recognizing the nature of the ailment of which the "fit" is merely a symptom—a kind of nervous "storm," as it were—it is clear the efforts of the ambulance student must here be guided by very plain and common-sense principles. What the bystander has to do in a case of epilepsy is simply to prevent the patient from injuring himself, and to secure him against hurt.

The symptoms of epilepsy led men in former epochs of history to regard the patients as being "possessed of devils." The patient's seizure is usually of a sudden kind. He often gives a cry or shriek as he becomes conscious of the attack of his ailment. Then he falls down, becomes unconscious, and the "convulsions" begin. These are spasmodic movements of limbs and body. By some, a special feature of epilepsy is to be found in the bending or flexing of the fingers, and more especially the flexing of the thumb into the palm of the hand. The face may become much contorted, and the jaws twitch about. The tongue gets caught, as a rule, between the

teeth, and is bitten, with the result that blood flows from the patient's mouth. This sign, regarded by the bystanders as of alarming nature, is seen to be readily explained, and the noticing of such a symptom is one of our guides to a knowledge of the nature of the case. After a time, the convulsions cease, and the patient, much exhausted, opens his eyes. We must bear in mind that the seizure is apt to recur, and this fact should cause us to have the patient watched for some time after the first fit has passed away.

The treatment of the epileptic fit consists, as before, firstly, in removing all tight clothing from the neck. In the second place, we must see that the mouth is not obstructed in any way, that breathing is made easy, and that the patient is not allowed to throw himself over on his face, and thus impede respiration. He should be placed on a mattress on the floor, so that there may be no danger of his hurting himself by falling from a sofa or bed. Then, also, we must bear in mind that the fit is not to be "shaken out" of the patient, and that all rough treatment is to be sternly forbidden. The tendency on the part of the bystanders to seize his arms and legs, and to rigidly prevent all movement, is an absurd and erroneous practice. The unconscious man will fling about his limbs and body in the convulsive movements of the disease, and any attempts at needlessly and powerfully restraining him, may result in breaking his bones or otherwise seriously injuring him. Once I saw a servant girl in an epileptic fit, held firmly down by her fellow-servants, one of whom sat on her chest—the whole procedure reminding one forcibly of the treatment of a fallen horse. All that is really required is to grasp the wrists and ankles, firmly but gently, so as to prevent the patient from excessive movement, and from injury by knocking himself against furniture or other objects.

The tongue may be prevented from being further injured by some object being placed between the teeth—a handkerchief slightly rolled up is probably the best means of effecting this end; but care must be taken that the object used is not taken into the mouth, so as to become an obstacle to free breathing. After the fit has passed away, the patient is to be put to bed in a darkened room and sleep encouraged. He should, as has been already noted, be duly watched, in case of the return of the seizure. As regards the further care of persons known to be subject to epilepsy, it may be added, such patients should not be allowed to frequent dangerous places, while their general life, habits, and health should form

matter for rigid supervision, both by their guardians or friends, by themselves, and by the medical attendant.

The *hysterical fit* causes, as a rule, a good deal of commotion in private life, and occasionally in public life as well, while its importance stands in inverse ratio to the violence of its symptoms. The patients here are usually excitable girls, although the fit of hysterics is by no means unknown in the "sterner sex." The "patient"—if so she can be legitimately termed—on being roughly spoken to, on the receipt of bad news, or from a fancied insult or reproof, at once begins her attack of "nerves," and sets the household in a ferment. The fit always occurs in the neighbourhood of sympathetic bystanders. When the subject falls, she does not collapse, as in other "fits," regardless of consequences, but falls usually with much consideration for her own safety and comfort. She kicks and screams, and throws herself about; but the movements are not those of the true convulsive fit. Her eyes are not closed, or if they appear to be closed, she contrives to see what is going to be done in her case, and, on the first attempts at serious treatment, usually rebels in a very sensible manner. I am far from denying that hysterical fits are always semi-shams; but in all there is an element of unreality, of which the patient herself is conscious, and which only requires the exercise of common sense treatment for its dispersion and cure.

Upon the hysterical patient sympathy acts like fuel to the fire. These "fits" feed upon sympathy. They grow and increase in frequency, as kindliness and consideration are known to be forthcoming. The morbid tendency is fostered by such treatment, and that the "fits" may become chronic, where there has been no attempt made to overcome them by rational treatment, is a fact of medical experience.

The hysterical patient is to be treated, therefore, with plain promptness and ordinary measures. We have to impress on the patient's mind that we know there is nothing wrong; that she can, if she so wills it, overcome her supposed affliction; and that she must exercise her own self-control in its cure. No roughness is permissible; but if other measures fail a dash of cold water on the face produces discomfort enough to cause the "patient" often to remonstrate against the "cruelty" with which she is being treated. No sympathy must be expressed, whatever amount may be felt; and when all other modes of treatment fail the solitary reflection of the "patient" will be found effective. The slamming

of the door of her apartment, the retreat of friends, and the utter neglect of the case, are the remedies to be practised. It is because parents and friends do not (or will not) recognize the true nature of the hysterical fit, and because they will not treat it in a sensible manner, that girls are allowed to grow into a habit of hysteria. If the "hysterical habit" should become pronounced and chronic medical advice should be sought. Change of air, cheerful company, and tonics frequently cure such cases, which are the terror and annoyance of families and their friends.

(4) Very different in its nature is the *apoplectic fit*. Here a serious accident has occurred to the nervous system, in the shape of the rupture or plugging of a blood-vessel in the brain. In a typical case of what is named "effusion of blood" into the brain-substance, unconsciousness usually rapidly supervenes. The apoplexy is thus a prelude to, and the cause of, the "paralysis" which may be limited to one side of the body, or may be general. In old persons, the blood-vessels are apt to become brittle, and hence apoplexy more readily occurs in such cases.

The symptoms of the *apoplectic fit* are as follows:—Deep unconsciousness, from which the patient cannot be roused; the breathing is "stertorous," that is, of a snoring, puffing character; the face is flushed and congested; the lips and cheeks are puffed out during expiration; the pupils of the eyes are usually dilated, unequal, and do not, as in health, contract on exposure to light; the heart and pulse are full and strong; there is usually to be seen a want of power, limpness, or flaccidity of one limb or side of the body; while the age of the patient—usually at or past middle life—may also serve as a guide to the nature of the case. We should bear in mind the fact noted above, that apoplexy and drunkenness may occur together, and that the mere smell of liquor is by itself no criterion that the case is one of deep inebriation alone.

The treatment of the apoplectic fit, like that of the epileptic fit, resolves itself largely into making the patient comfortable, in sending at once for medical aid, and in waiting the return of consciousness—which, however, may be long delayed. (1) Loosen the neck and chest clothing; (2) see that breathing is rendered easy; (3) place the patient in a well-aired room; (4) *raise the head*, comfortably, in a line with the neck and shoulders; (5) apply cold cloths or ice to the head; (6) put hot-water bottles or mustard poultices to the feet.

If medical assistance is delayed, and croton oil can be had,

place *one drop* of the oil on a small piece of sugar and insert it into the mouth. This is to be done with the object of causing action of the bowels. As already remarked, do not attempt to give fluids to an insensible person; and above all, remember that *in apoplexy stimulants are absolutely forbidden as highly injurious.*

(5) The fit and loss of consciousness, which is due to that condition known as *uræmia*, are matters somewhat difficult of distinction by the ambulance student. It is, however, important that the signs and symptoms of such an attack should be duly noted, if only by way of rendering our remarks on this subject of a complete nature.

The affection in question is connected, as already remarked, with kidney-disease. When an acute and sudden attack comes on, the symptoms may resemble those of apoplexy. There is, however, no paralysis of one side, as in the latter affection, and the breathing is not of the "stertorous" or snoring character just noted. A chloroform-like odour of the breath is, as a rule, to be noticed as a symptom of uræmia. From epilepsy the uræmic fit is distinguished by the patient rarely giving vent to the cry which heralds the attack of the former disease, while the thumbs are not turned in on the palms of the hands, and there is not the deathly pallor of the skin seen in ordinary fainting.

The treatment of a uræmic fit, as far as the ambulance student is concerned, resolves itself into sending at once for medical aid. If this should be long delayed, dry cupping, and poulticing over the loins, are the measures which should be resorted to.

(6) When a patient suffers from loss of consciousness due to *concussion of the brain* the symptoms will usually point to injury to the head itself, and to other circumstances indicating violence, foul play, or accident. The symptoms in a typical case of brain-concussion are, firstly, loss of consciousness and motion. If the patient is capable of being roused, he, as a rule, speedily relapses into an unconscious state. The pulse is feeble, and the pupils of the eyes are contracted. The treatment of a case of this kind consists in the restoration of heat by wrapping the patient in warm blankets. Hot-water bottles should be applied to the feet, and the surface of the body may be rubbed with hot flannels. If the accident is one in which *compression* of the brain occurs, as when a portion of bone has been displaced so as to press on the brain, we find complete and deep unconsciousness, snoring, or "stertorous" breathing; the pupils of the eyes dilated, a full, slow pulse, and a hot, moist skin. Examination of the head, which should be carried

out in *all* cases of unconsciousness where the cause of the ailment is unknown, will reveal the injury. The patient is simply to be made comfortable pending the arrival of the surgeon, since in compression of the brain an operation becomes necessary. Undo all tight clothing about the neck and chest, as in other cases of unconsciousness; see that the mouth is cleared of any obstruction to breathing, and keep the head elevated slightly, in the ordinary condition of repose. The patient should be kept in a well-ventilated room, and cold may be applied to the head. A mustard plaster may be applied, if the circumstances are favourable, to the soles of the feet.

In concluding questions of treatment relating to accidents involving unconsciousness and fits, the subject of *shock* is one which demands attention from the ambulance student. The name "shock" is applied, as every one knows, to the effects which are produced on the nervous system by a severe blow, accident, or even by a strong mental impression. In its nature or degree, "shock" varies greatly with individual constitutions and circumstances. What will cause insensibility and a long convalescence in one person may scarcely affect another. After burns and scalds, after accidents, blows, and concussions, shock is liable to occur. Hence it becomes necessary that we should know what to do when such a result occurs.

The symptom which attracts our notice in a case of "shock" after accident is the coldness of the patient. Even in the heat of summer he is chilled and complains of cold. He shivers and exhibits all the signs of loss of heat. There may be no unconsciousness, and the patient may be able perfectly to describe his symptoms and their cause, but that he is ill at ease and ailing, is clear to every observer. His skin feels cold, and his pulse is feeble.

We gain hints from this condition of matters regarding the treatment of such a case. The natural temperature of a healthy body is about 98·5 deg. measured by Fahrenheit's thermometer. In shock, if the temperature be taken, we find the heat lowered, and the thermometer may show us 95 deg., or even a lower degree, as the temperature of the patient. Suffering, as he does, from loss of heat, it becomes clear we must treat him by applying warmth. It is the same in the starving man. Death in *starvation* is really due to loss of heat; and instead of giving the person, who is at death's door from starvation, food, it is better to apply warmth at first, until he is sufficiently revived to take nourishment with safety.

Whatever may be the nature of the accident which occasions "shock," we must attend to the latter condition, as well as to the results of the accident themselves. We keep the patient warm by wrapping him in blankets. He is to be conveyed to a warm, but not overheated, room. He may be supplied with hot drinks—tea, coffee, milk, or weak brandy and hot water. In this way, we seek to counteract the loss of heat, and render thereby the after-recovery of the patient more hopeful and secure.

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CHAPTER VI.

THE TREATMENT OF THE APPARENTLY DROWNED.

It is important, in considering the treatment of the apparently drowned, to bear in mind that the number of preventable deaths from drowning is very large. The public, seeing a man taken out of the water, pale, pulseless, with breathing arrested, and with no sign of life apparent, is apt to conclude that all hope is gone, and that the individual has really perished. There is no greater mistake or more lamentable ignorance than this. Persons have been restored to animation after more than an hour's hard work. Every doctor knows of such cases. The mere pulselessness, suspension of breathing, and apparent cessation of the heart's action are signs, not of death, but of *temporary suspension of the vital functions.* Left in this state, the man will perish. Properly attended to, he will probably recover. What we have to do—and, I should like to add, *to do promptly, energetically, and at once*—is to attempt to fan the lingering spark of life into its usual flame.

In the second place, I should remark that many lives are lost in drowning cases from the application of erroneous and barbarous methods of treatment. For example, medical men have frequently, and at cost of considerable opposition, to prevent the body of a half-drowned man from being rolled on casks. At the seaside especially, this treatment is often adopted, owing to the prevalence of some extraordinary idea regarding the effectiveness of such treatment in getting rid of the water the patient is supposed to have swallowed. Again, we have to caution people against holding the body of such a patient up by the feet, and to warn the public against

the evil effects of placing a half-drowned man in a warm bath, under the utterly mistaken notion that this treatment will revive him.

With numberless errors of this kind at hand, it is evident the demand for ambulance instruction on the part of the public has come none too soon. It is by no means a difficult thing to acquire a knowledge of the means to be adopted in cases of immersion in the water. The saddest part of any man's (or woman's) life is to know that the life which has been lost might have been saved by the instant application of simple ambulance information.

In drowning cases there is seen a kind of graduated scale, in respect of the severity and gravity of the occurrence. Thus, let us take a case of what we may call simple immersion. Here, a person falls into the water, and is promptly fished out. He has never lost consciousness, and is only dazed by the fright and plunge. In such a simple case no treatment is necessary beyond that which common sense dictates. The individual should at once change his clothes; he should be briskly rubbed down with hard bath-towels; and he should go to bed (and lie between the blankets), so as to promote warmth and to avoid possible chill. After a few hours' rest he will probably feel perfectly well.

Going a step further, we find the case of the person who has been rescued in an unconscious state, but in whom breathing is seen to be natural enough in a way, and in whom the heart and pulse are found to be hard at work. Here, what should be done is simply first to loosen every garment in the neighbourhood of the neck, braces included (a standing rule in *all* cases of insensibility), so as to expose chest, neck, and face to the air. We must then rapidly turn the patient face downwards; one of the arms being placed under the forehead, so as to allow any water which may be present in the mouth and upper part of the throat to escape. Particularly see that the tongue falls forwards. Wipe and cleanse the mouth; turn the patient round, and by this time consciousness will most likely have returned. The escape of even a small quantity of water from the mouth will aid this latter result; and when the patient opens his eyes and regains consciousness, hurry him off to bed, and promote warmth as above described. If he is very cold and chilled, use hot-water bottles or heated bricks to the soles of the feet, pit of stomach, and armpits. When he can swallow, a very little warm water, warm coffee, or warm brandy and water may be given at intervals. It is a most unwise thing to give *large* quantities of

stimulants or fluids of any kind under such circumstances. If the patient feels weary and heavy, let him go to sleep. If his breathing is rather laboured and painful, a large mustard plaster on the chest and below the shoulders will relieve him.

Let his bedroom, above all, be airy and cool. Turn out all useless persons, of whom there is usually a superabundance in such cases. As has well been remarked, "These persons consume the pure air (and frequently the spirits) meant for the patient alone." An admirable plan which assists in restoring the circulation in all cases of drowning, whether consciousness is present or not, is that of rubbing the legs and arms *upwards*, with the warm hand or with warm flannels. In this way, the blood in the veins is assisted in its return to the heart, and that organ again thereby encouraged to resume its duty. Sometimes, vomiting should be induced, if the stomach feels distended, and if the difficulty of breathing continues.

From such a simple case of loss of consciousness we now come to those instances in which death is simulated in the most exact manner. These latter are the most serious cases, of course, with which the public may have to deal in the absence of the doctor. Keep in mind what has been already said—that not even the fear, or the conviction, of the person being already dead justifies you in ceasing attempts to revive him. You should make it an inviolate rule in every case of apparent death *to persist for hours, if necessary,* in the attempt to restore consciousness.

The person, then, let us suppose, has been taken out of the water. As before, loosen everything about the neck and chest; bare the chest completely, in fact. What you have now to do is (1) *to restore breathing—that* is the main duty, before which all other duties pale in significance; (2) after breathing is restored, *to promote warmth*, to restore the circulation, and to tide the patient over the effects of fright, cold, and collapse.

Primarily, as before, turn the patient over on his face, one arm bent beneath his forehead to clear the mouth of water; and see that the tongue is well forward. *The tongue allowed to lie back in the mouth may obstruct breathing, and render vain your best efforts.* Excite the nostrils with snuff, hartshorn; rub the chest and face; and dash hot and cold water on chest and face. If these means are not effectual in a few moments, or if (as is usual) they are not at hand, then you must *at once* begin the practice of *artificial respiration* (or breathing).

There are three ways of exciting the chest and lungs to perform

their natural duties. One method—that of Marshall Hall—is practised as follows:—

Place the patient on his face, and fold a coat for his chest to rest upon. Now turn the patient gently (gentleness and firmness—not roughness—is required all through this work) on the side; then briskly reverse him on his face. Next place him on his side as before, then on his face, and so on, repeating these movements fifteen times per minute, and varying the side on which he is turned once every minute or so. The explanation of this method is easily learned. When we place the patient on his side, air enters the

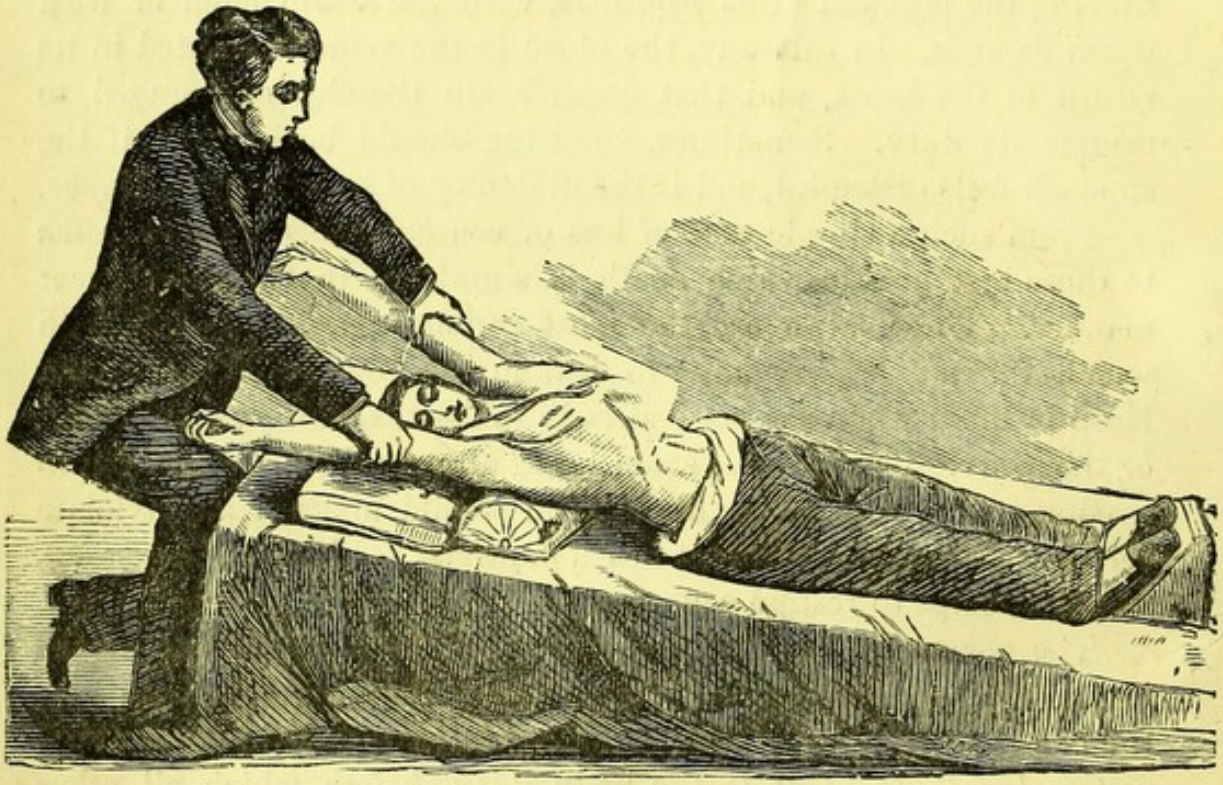

Fig. 2.—The First Movement in Artificial Respiration.
(Silvester's Method.)

lungs; when he is placed on his face, the chest is compressed, and air is forced out. The movements of breathing are thus imitated. It must be added that when the patient is placed on his face a person should make firm and sudden pressure with his hand on the back between the shoulder-blades, so as to assist in compressing the chest and in imitating "breathing out." Of course, during these operations the mouth must not be allowed to come in contact with the ground or table; and it should be made a rule that the tongue be well drawn forward, or secured by an indiarubber band placed over the tongue and under the chin.

In the second method, that of Howard, the patient is to be

treated as follows:—The clothes are rapidly removed and rolled up into the form of a bolster, the patient is then turned on his face, with the bolster under the pit of the stomach, the head being the most dependent part. The object is to allow all fluid to escape from the mouth and throat. This is more effectually accomplished by the operator placing both hands on the back of the patient immediately above the bolster, and forcibly compressing the stomach and lower part of the chest against the bolster for a few seconds two or three times, with very short intervals. The patient is now turned on his back, the bolster beneath it making the lower ribs and pit of the stomach the highest point of the body, the

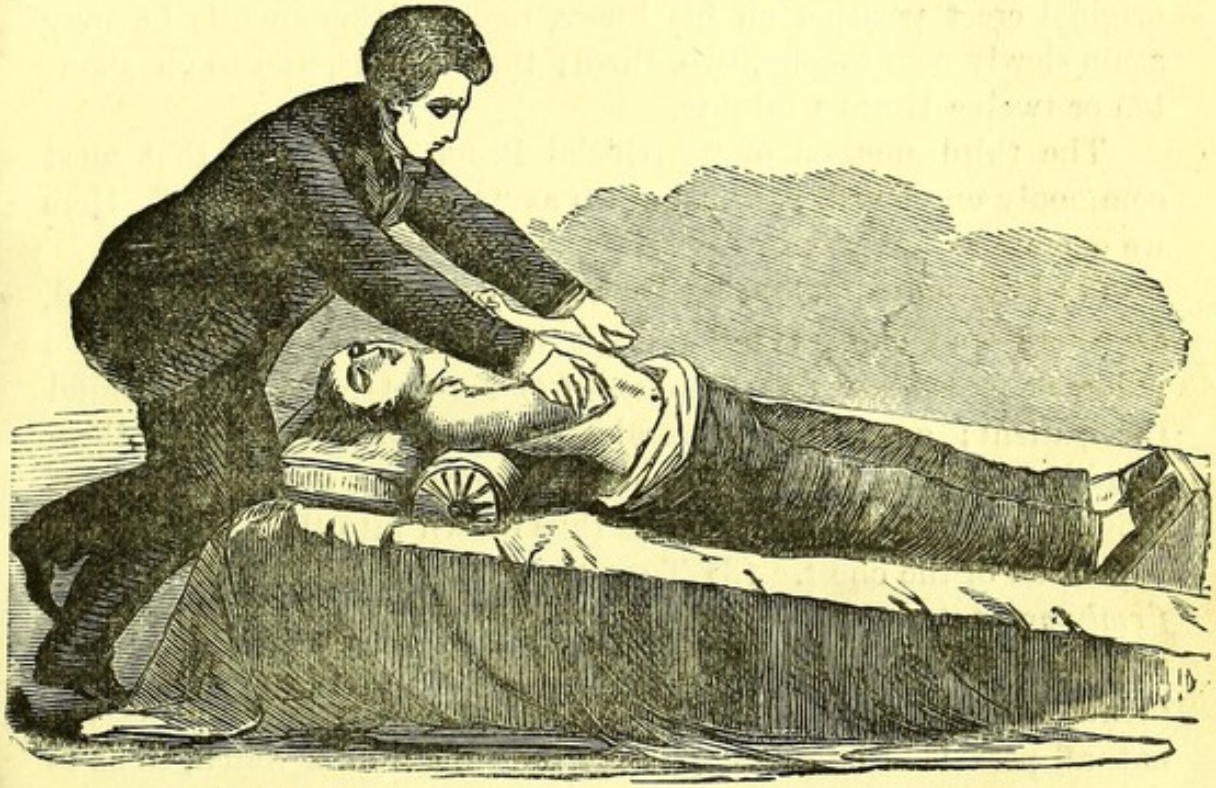

Fig. 3.—The Second Movement in Artificial Respiration.
(Silvester's Method.)

shoulders and the head just resting on the ground. The patient's wrists are next seized, the arms extended fully behind the head and pinned to the ground with the operator's left hand, while with his right thumb and forefinger, covered with a dry pocket-handkerchief, he pulls out the tongue and holds it at the extreme right corner of the mouth. In this way the air passages are kept freely open, and the lungs and chest are now in a position for such expansion as is unattainable in any other manner. The organs of the abdomen are also out of the way, as, by the law of gravitation, they tend to sink down from the pit of the stomach, which is the highest point,

and so the action of the diaphragm, or "midriff," the great muscle of breathing, is left unimpeded.

Having given the wrists and tongue to an assistant, the operator now kneels astride the patient's hips and rests the ball of each thumb just where, on either side, the lower ribs join the breast-bone or sternum. The fingers then fall naturally into the spaces between the ribs. Now, resting his elbows against his sides, and using his knees as a pivot, the operator throws the whole weight of his body slowly and steadily forward, until his mouth nearly touches the mouth of the patient, and remains while he may slowly count—one, two, three; then, *suddenly*, by a final push, he springs back to his original erect position on his knees, remains there while he may again slowly count—one, two, three; then repeats, and so on about ten or twelve times a minute.

The third method of "Artificial Respiration," and that most commonly employed, is that known as "Silvester's method." Here we operate as follows:—

(1) Lay the patient on his back on a flat surface, tongue secured, as before, and chest bare; support his head and shoulders by a pillow or folded coat (*see figures*). (2) Now stand or kneel behind the patient; grasp his arms above the elbows, and draw them steadily upwards above the head, *keeping the arms so stretched* (Fig. 2) *for two seconds.* Air is thus drawn into the lungs by the expansion of the chest. (3) Turn the arms down, and press them *firmly* against the sides of the chest for two seconds (Fig. 3). In this way air is expelled from the lungs. (3) Repeat these movements from fifteen to twenty times a minute, thus imitating the natural periods of breathing. Take the time from a watch, so as to ensure regularity of performance. (4) Direct an assistant, at the moment the arms are turned down (Fig. 3), to press firmly inwards, with one hand on each side, at the bottom of the chest. In this way the movement of "breathing out" is assisted, and the "midriff," or diaphragm, the great muscle of breathing, which separates chest from abdomen, is incited to act.

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CHAPTER VII.

THE TREATMENT OF WOUNDS AND BLEEDING.

BEFORE we can understand with any degree of intelligence the principles on which surgeons treat wounds and bleeding (or *hæmorrhage*, as it is technically termed), and before we can hope to apply these principles in our practice of ambulance work, it is absolutely necessary that we should, first of all, endeavour to gain some information concerning the nature of the blood, and of its circulation by means of the heart and blood-vessels. Here, as elsewhere, we shall find the directions of the ambulance teacher become clear and easily remembered, provided they are founded upon the student's knowledge of the structure and functions of the parts which are concerned in the natural work of the body. "Rule-of-thumb" teaching is never successful. It is too much like the "learning by rote" of the parrot, and it can never be trusted to be of service in a sudden emergency, when, as is the case with bleeding and wounds, moments—not to speak of minutes—are of the utmost importance for the saving of life.

On these grounds, then, let us glance, firstly, at the blood itself, and then at its circulation through the body.

Blood to the naked eye is a red fluid, the sight of which is to many, or indeed to most persons, highly disagreeable, especially if profuse bleeding has occurred. A word may not be out of place here respecting this not unnatural "failing," if it may so be termed. There are certain persons who never can overcome their repugnance to the sight of blood. These persons, it may be confessed, will make but poor ambulance students, and will be unable to render assistance when accidents occur. There are others, again, who simply turn slightly squeamish at the sight of wounds, but who, by a strong effort, contrive to overcome this feeling, and to play their part in rendering "first aid." The only advice one can give under the circumstances is that of advising all ambulance students to accustom themselves to the sight of blood, as, for example, by a visit now and then to a slaughter-house. It must be remembered we are dealing with no fastidious subject; nor is the occasion one of ordinary nature. There does not exist a person who, in the face of a serious accident, would not wish to be of service, and to save

life. This duty requires training, as we have seen, and part of the training—an all-essential part, it may be added—consists in the ambulance student being enabled to be cool and collected when accidents occur, whoever else may be flurried and excited. Hence, it may be laid down as a fixed rule, that such persons as desire to qualify themselves for ambulance work must have no fear or timidity at the sight of blood. Some of the most serious injuries which can happen are attended with loss of blood, and ambulance duty is that of staunching the bleeding, of arresting the flow of the vital fluid, and of literally preventing the patient's life from ebbing away. On these grounds, then, let me recommend the student to conquer, by any means in his power, the aversion to blood—if such

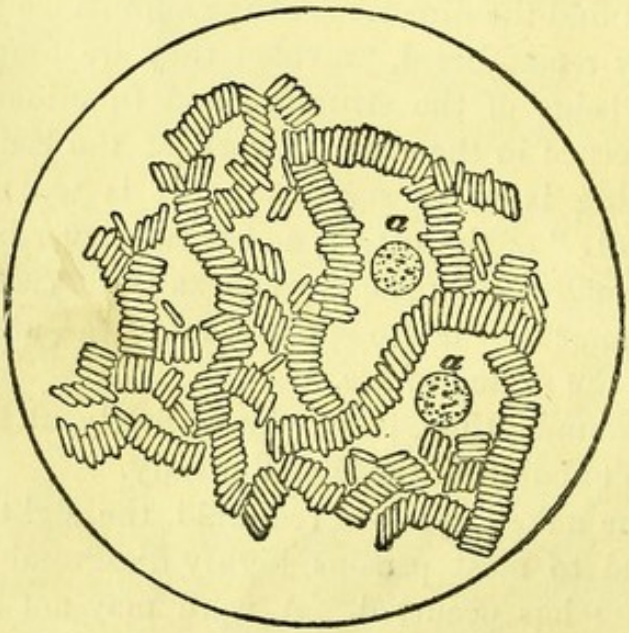

Fig. 4.—A Thin Film of Blood, highly magnified.

aversion exists. Otherwise, his chances of being an excellent aid in distress and a reliable "friend in need" must be of limited kind.

Blood, red as it is to the naked eye, is a fluid as clear as water, and derives its red colour from the multitudes of red bodies—called the *red corpuscles*—which float in it. These bodies are so numerous that the eye cannot detect the fluid (the *lymph* or *plasma*) in which they float. The microscope merely enables us to see this fluid when we press a thin film of blood between two plates of glass. The view then seen is that depicted in Fig. 4, where the *red corpuscles* are beheld forming *rouleaux* like piles of coins, white corpuscles (*a a*) being also shown.

Such being the real nature of the apparently red fluid, blood,

we are enabled to form some idea of what happens when blood clots or *coagulates.* When we scratch the finger with a needle, why does not the wound continue to bleed? The answer is, because the blood clots, forms a temporary barrier to the flow, and thus gives the vessels which have been wounded time to contract and to heal. The clotting of blood, then, is a valuable quality in the light of the stoppage of bleeding. When a clot has formed on a wound, we should, therefore, see that it is not disturbed. It represents Nature's method of arresting the flow. The exact nature of the clotting of blood is still a puzzle to men of science. The "clot" itself is formed by the red corpuscles becoming entangled in a meshwork formed by a substance known as *fibrin,* while the liquid part of the blood (or *plasma*) is separated from the clot.

As most persons know, the blood circulates and is contained in tubes known as *blood-vessels.* These are the pipes which distribute this fluid throughout the body. They are in communication more or less direct with the *heart,* which, again, is the pumping engine of the body. The heart is a *hollow muscle,* and it is by its contractions that it forces the blood through the vessels.

Three kinds of blood-vessels exist in the body. These are (1) *arteries,* (2) *capillaries,* and (3) *veins.* Let us study the differences between these vessels, seeing that such knowledge forms the foundation of the successful treatment of wounds.

An artery is a vessel which (1) contains *pure blood, of light red colour,* (2) carries this pure blood *from* heart *to* body, and (3) *pulsates* (or "beats") in corresponding time to the heart. Place your finger on the thumb-side of the front of your forearm, about an inch or so above the wrist, and you will feel what we term "the pulse" —that is, the beating of one (the *radial* artery) of the vessels which is carrying pure blood to nourish the hand. The "beats" are caused by the impulses of the heart sending waves of blood along the vessel, which is itself highly elastic.

If we traced out this artery, or any one of the branches it gives off, we would at last be compelled to use a microscope, and should find that it did not terminate like a gas or water-pipe in a house in a "cut" off end. On the contrary, we must bear in mind that no blood-vessel ends in this fashion, otherwise there could be no "circulation"—a term meaning, obviously, a "round" of blood through the body. We should find our artery at last to branch out into a network of very fine tubes. The smallest of these tubes would measure across about the one-three-thousandth ($\frac{1}{3000}$th)

part of an inch. These are *capillaries.* They are therefore the smallest vessels of the body, destined to bring the blood into relation with the most minute cells and parts of our frame.

The arteries, then, everywhere become *capillaries.* But if we followed out the capillaries in their turn, how should we find these latter vessels arranged? The answer is, that we should see them grow larger and larger, *until they united to form the veins.* To put the matter in another way, we observe that *while arteries end in capillaries, veins begin in capillaries.*

We have seen that blood, for example, passes to the hand along

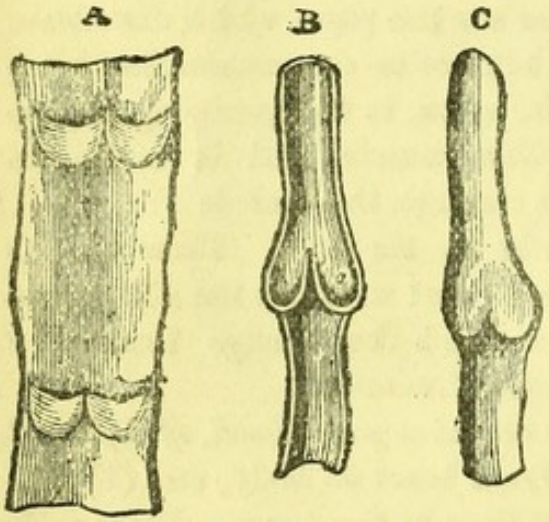

Fig. 5.—The Valves of the Veins.

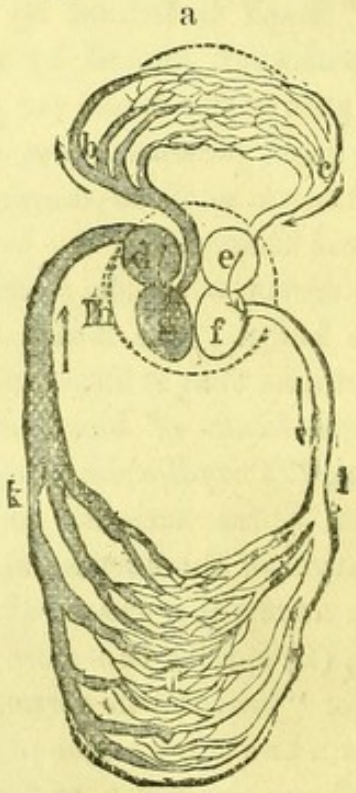

Fig. 6.—Diagram of the Circulation.

the artery in which the "pulse" is felt among other vessels. Look now at the back of the hand. We see therein the familiar blue *veins.* Grasp the wrist firmly, and hold the hand down by the side. The veins swell, because we are obstructing the flow of blood which, *in the veins, is passing up the arm on its way back to the heart and lungs.*

Hence we learn that a vein differs from the artery (1) *in its carrying impure blood, of dark purple colour;* (2) in that *blood being carried back to the heart and from the body;* and (3) *in there being no pulse in a vein.* When a vein is examined, also, we find it to be provided (see Fig. 5) with little pocket-like valves. Thus

at A these valves are shown, the vein being laid open. At B and C the valves are seen from the side. As the pockets open *towards* the heart, it is clear the blood can pass in that direction only.

We may now profitably turn to the *circulation of the blood*, by way of showing how these vessels become related to the heart in the general work of distributing the blood through the body.

In Fig. 6 the plan of the circulation is shown. Here the heart is seen to consist of two sides (right and left), completely separated from each other. Each side is divided into a smaller and upper compartment (the *auricle*), and into a larger and lower chamber (the *ventricle*). The *right* side of the heart belongs to the *veins*, and the *left* to the *arteries*. In the figure, *a* represents the *lungs*, and *l* the body, while the arteries are represented by the light vessels and the veins by the shaded parts.

If we begin at the lungs, we see how the pure blood passes back through the vessels (*c*) to the *left auricle* (*e*) of the heart. Thence it passes to the *left ventricle* (*f*), which, in its turn, sends this pure (or arterial) blood out everywhere through the body. In the body (*l*) this blood passes through the network of capillaries. It then becomes impure, or *venous*, in character; and accordingly flows on to find itself in the *veins* (*k*). These return this impure blood to the *right auricle* (*d*) of the heart. Thence the blood passes into the *right ventricle* (*g*), which propels it in turn through vessels (*b*) to the *lungs* (*a*); so that we arrive at the point from which we started, and have thus made the round of the "circulation."

If we bear in mind the cardinal points (1) that the arteries carry pure blood from the left side of the heart *to the body*, and (2) that the veins carry impure blood back *to the heart and lungs*, we shall not easily mistake the principles on which wounds of arteries and of veins are respectively to be treated.

Having observed the characters of *arteries* and *veins* respectively, and having seen that *capillaries* are the minute blood-vessels which unite them, we may now proceed to note the means which are to be taken for the arrest of hæmorrhage, or bleeding.

In the first place, we may direct attention to *internal bleeding*. Thus, from lungs or stomach, or from the throat itself, alarming bleeding may take place, as the result of disease, or after injuries. The blood which comes from the *lungs* is, as a rule, scarlet in colour; it is coughed up; and it is frothy, because it is mixed with air. If bleeding takes place from the *stomach*, on the other hand,

the blood is usually dark-coloured, wants the frothy appearance, and is often clotted.

All cases of internal bleeding may be treated (1) by placing the patient in a cool atmosphere; (2) by placing him in a resting position—flat on his back, if faintness supervenes; (3) by avoiding all exertion and prescribing absolute rest; and (4) by giving him ice to suck, or, in lieu of ice, cold water in sips, or vinegar and water; cold tea, or alum and water—all of which fluids act as *astringents*, and tend to arrest the bleeding.

Bleeding from the nose (or *epistaxis*) is to be treated by placing the patient on a couch (it is wrong to allow him to hang his head over a basin); by raising his arms above his head, and keeping them in this position; by applying a wet sponge to the back of the neck; and by placing ice or cold water cloths on the nose and forehead. If the bleeding should persist, the plan of injecting cold water up the nostrils may be tried—some authorities are in favour of employing hot water, as tending to induce contraction of the blood-vessels more readily than cold—or alum and water may be tried. Failing to obtain relief thus, the nostrils should be plugged with cotton-wool or soft rags, and quiet and rest recommended. It should be borne in mind that where bleeding from the nose becomes frequent, and is repeated at short intervals, the affection is a sign of weak general health, and a physician should be consulted in such a case without delay.

With regard to *poisoned wounds*, these have been already treated (see p. 14). The injuries which now engage our attention are ordinary wounds, such as become dangerous from the loss of blood they entail. Two points should be impressed on the mind in connection with this subject—firstly, that a wound of a large artery may prove fatal in a very few minutes (from the fact that the left ventricle of the heart is directly driving the blood from the wound), and that aid must, therefore, be rendered at once. Secondly, that we ought to distinguish between bleeding from an artery and bleeding from a vein, since the treatment varies greatly, according to the nature of the vessel which is wounded. Thus, remember that in bleeding from an *artery*, the blood is of scarlet colour, and that it comes in *jets or jerks* because it is pure blood, and because it is being driven *from* the heart *to* the body. In the case of the *vein*, remember that the blood is of dark-red or purple colour, that it oozes from a wound, and that it is flowing back *to* the heart *from* the body.

It follows that in bleeding from an artery, *we have to apply pressure between the heart and the wound.* In bleeding from a vein, *conversely, we have to apply pressure below the wound, or on the side of the wound furthest from the heart.*

Wounds are often classified into *incised wounds*, or those which are represented by "clean cuts;" *contused wounds*, where there is bruising and injury in addition to cuts; and *lacerated wounds*, where there is much tearing of parts. In the two latter classes of wounds there is usually little bleeding, owing to the torn vessels contracting. In a *simple cut*, after cleansing the wound with water, bring the edges together with plaster, and apply cold water dressings of friar's balsam. Where *contused* or *bruised wounds* occur, it is best to apply a lotion of Hazeline or of Pond's Extract and water (one part to three of water) or spirits (one part to two of water) on a piece of lint, and to place another piece of lint over the first, securing the dressings by a simple bandage. If a severe bruise is to be dressed, bathe the wound with hot water, and ease the pain by placing hot flannels over the injured part. Cold lotion may also be employed, if they are found to be preferred by the patient. For *lacerated wounds*, take the precautions (if the injury is severe) to be hereafter detailed against bleeding, by putting on a tourniquet in readiness to be tightened, if necessary; use flannels wrung out of hot water as a dressing, and keep the patient warm, as already directed under the head of "Shock." (See p. 26.)

Dealing first with ordinary *capillary bleeding*—that is, from the minute blood-vessels of the skin—we find the blood to be red in colour, and to ooze from the surface in a recurring stream. Here continued pressure is usually sufficient to assuage the flow; if this fails, apply a pad of lint, and bandage it firmly over the wound, or apply in addition *styptics* (remedies which cause contraction of the blood-vessels), represented by cold air and cold water, ice, vinegar and water, Pond's Extract, steel drops (*tincture of the perchloride of iron*), friar's balsam, etc. One caution should always be borne in mind in dealing with the subject of bleeding, viz. *never to disturb a clot when this has formed on the cut.* Clotting (or *coagulation*) of blood is Nature's method of arresting bleeding; and it is this process we try to bring about when cobwebs, cotton-wool, or other substance is placed on a wound. It is by "clotting" that bleeding from an ordinary scratch is made to cease. In all wounds, therefore, the clot should, as a rule, be left undisturbed, unless some urgent necessity exists for its removal—as, for example, the

need to ensure that the complete cessation of any slight oozing which may be going on.

Bleeding from veins may next be noticed. There is, as a rule, little danger to be apprehended from venous bleeding, except where the vein is a large one, or where the wound happens to occur in a vein near the heart (as in the neck, for example), and where there is a danger of air entering the circulation—always a serious, and often a fatal, accident.

The blood oozes from the wound, and it is dark purple in colour, as already noted, while we observe also that the blood issues from the end of the cut vein which is furthest from the heart. The treatment in such a case is to apply pressure on the wound itself, and then to bandage a compress or pad of lint, or a folded handkerchief on the wound; while, if these measures are not sufficient to arrest the bleeding, we may apply pressure *below* the wound, while the limb should also be raised. This latter advice, that of *raising the limb*, should be attended to in all cases of severe bleeding.

In the case of enlarged (or *varicose*) veins, the bleeding may come from both ends of the vein—that is, above and below. Cases of fatal bleeding from varicose veins are not uncommon, owing to the patient fainting, and thus failing to render assistance to himself. In these injuries, place a compress on the wound, make pressure *both above and below* it by bandaging; then raise the limb, and keep the patient quiet in the recumbent position.

Troublesome and continuous oozing from veins is apt to occur after leech-bites, and also after the extraction of teeth. The bleeding in such a case is often found to issue from one or two small points, and the proper treatment is to attack these points separately. Thus, in a leech-bite, graduated pressure may be made into, and upon, the wound by means of a very small piece of lint, over which larger pieces are placed. In the case of the bleeding socket of a tooth, the same rule holds good, while "steel drops" and other styptics may also be used, as already directed.

In extreme cases, pass a fine needle through the skin, so as to transfix the wound crosswise, and then wind sewing cotton in "figure-of-8" fashion round the needle, so as to pull the edges of the wound together. This will suffice to control the hæmorrhage.

In the case of leech-bites, in children especially, a needful caution may here be added. When a leech has dropped off (it should never be pulled off, as the teeth may be left in the wound, and cause irritation and suppuration), the child should be watched

for some time afterwards, even if the bleeding has apparently ceased. Occasionally a leech-bite will start afresh, and if the child is left unheeded, dangerous and weakening hæmorrhage may occur. It should be the duty of the mother or nurse so to watch the child that all risk of such a preventable accident occurring may be completely avoided.

In order that we may understand the methods which are to be employed in arresting *arterial* bleeding, which has just been shown to constitute the most dangerous form of this description of injury, a brief study of the distribution of the chief arteries of the body becomes necessary.

The *arteries* arise from the left ventricle of the heart, whence a great main-vessel called the *aorta* takes its origin. The aorta forms an arch over the heart in its course, and from this arch are given off the arteries which supply the head and neck. For example, the *innominate artery* is found dividing into (1) the *right common carotid artery* (which runs up the neck), and (2) the *right subclavian artery*, which is the main-pipe for the right arm. On the left side is the *left common carotid*, which passes up the left side of the neck, and the *left subclavian* supplying the left arm.

The aorta, after its arch or commencement is passed, is found to run a straight course down the spine, and ultimately to branch below into two vessels called the *common iliac arteries*. Each of these divides in turn into two branches—*external* and *internal iliacs*. The former passes out at the top of the thigh, and forms the main vessel for supplying the lower limb. The latter branches out inside the pelvis or haunch, and supplies the various organs therein contained with blood.

Now, it is a recognized principle of ambulance instruction that, when the student is called to a wound of an artery, he must *at once apply pressure between the wound and the heart*, so as to control the bleeding and save loss of blood. When we reflect that death may occur in a very few minutes from a wound of a large artery, it can well be understood why pressure made *at once* between the wound and the heart, on the artery itself, should be the first care of the student, and before even a tourniquet can be got ready. "Fingers first," should, in fact, be the rule in such cases. We may, therefore, very profitably study at present the situations in which pressure may be readily made upon arteries so as to check the flow of blood. In the accompanying diagram (Fig. 7) the situations in which pressure may be readily applied are indicated by crosses (×).

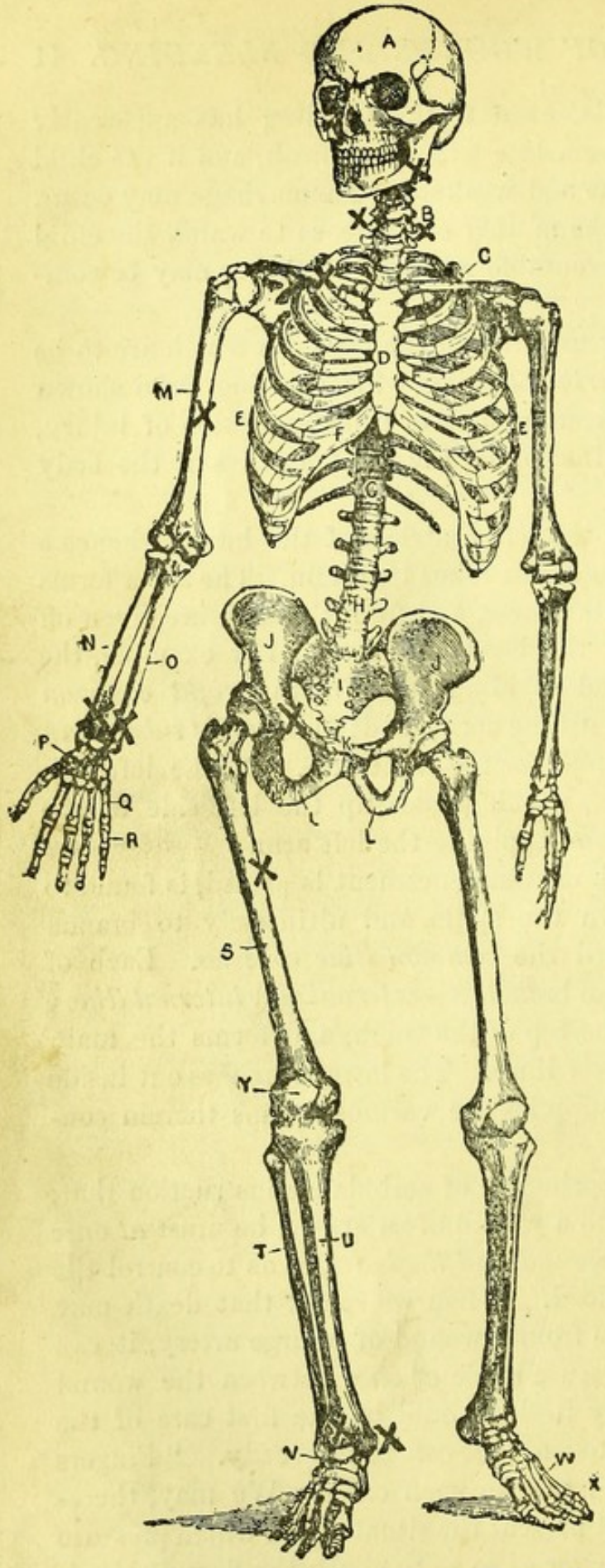

Fig. 7.—The points on which pressure may be made on arteries. The crosses mark the situations in which pressure may be applied to arteries.

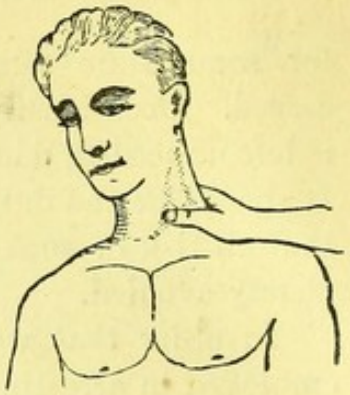

Fig. 8.—Compressing the carotid artery going to the head and face.

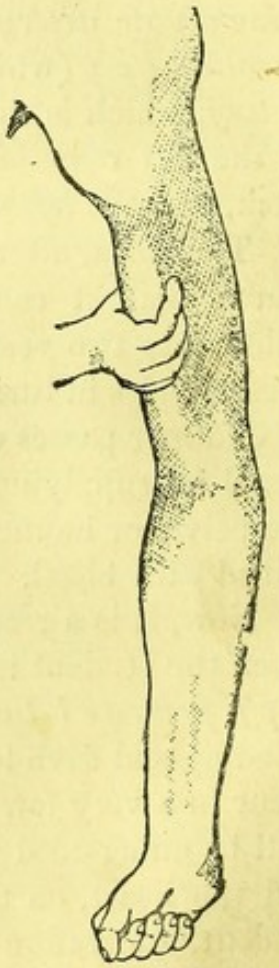

Fig. 9.—Compressing the brachial artery in the upper arm.

Thus, in *bleeding from the face*, below the eyes, it is advisable to grasp the cheek with the finger in the mouth and the thumb outside; or pressure may be applied to the *facial artery* (see × Fig. 7), where it crosses over the edge of the lower jaw. A bandage and pad of lint can be applied here readily enough. The facial artery can be easily felt pulsating as it crosses the edge of the lower jaw on its way to the face.

It may happen that bleeding in the face cannot be checked by pressure on the facial artery, or that the wound may be in the upper part of the throat itself. In such a case pressure is to be made on the carotid artery of the injured side. Press the artery, which can readily be detected beating in the neck, firmly against the spine or backbone. The crosses in the diagram (at B) indicate where such pressure is to be applied; while in Fig. 8 the thumb is shown in the act of making the pressure in question.

Passing now to wounds of the *armpit* (or *axilla*), pressure should be made on the *subclavian artery*, which lies on the first rib, and behind the collar-bone. The artery is easily felt by baring the neck, taking a deep breath, and observing the hollow space, which children call the "bird's nest," situated just above each collar-bone. If the finger (as indicated by the cross in Fig. 7) be pushed well into this space behind the collar-bone, it will meet the first rib, and will compress the artery against the rib. Such pressure will control the circulation in the whole arm; but is specially useful for bleeding in the armpit. Another method of applying pressure on wounds of the armpit is by compressing the armpit (or *axillary*) artery itself. The fingers are to be pushed into the wound, and the artery pressed against the upper arm-bone (or humerus). It is the axillary artery which is felt beating when we place our fingers in the armpit itself.

Wounds of the upper arm, and of the forearm also, may be treated, as a first measure, by pressure applied to the *brachial artery*, which is the continuation of the axillary artery down the upper arm. The brachial artery runs a course, which, in a general way, has been described as corresponding to the inside seam of a coat or dress sleeve in the upper arm. In Fig. 7 pressure is to be applied as shown by the cross at M; while in Fig. 9, the fingers in the act of pressure are depicted.

At the elbow the brachial artery divides into two branches. One, the *radial artery*, runs along the thumb-side of the forearm and is the vessel in which the pulse is felt at the wrist. The other

is the *ulnar artery*, which runs down in the forearm, on the side of the little finger.

Pressure is to be made at the bend of the elbow for wounds of the forearm and hand. Thus (Fig. 10), a pad or compress of lint, or a rolled handkerchief, made so as to fit well into the hollow, is to

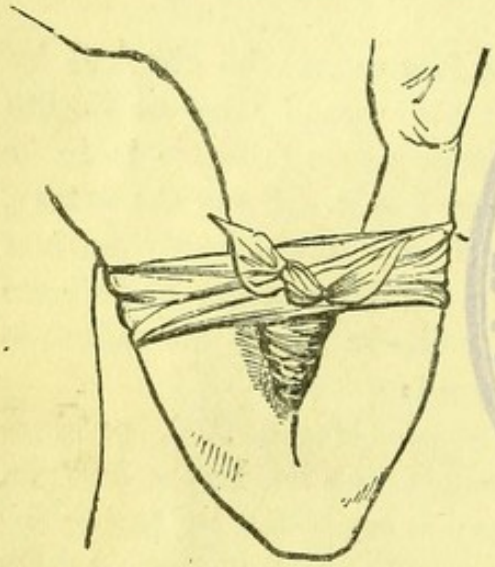

Fig. 10.—Pad applied at elbow to check bleeding in forearm.

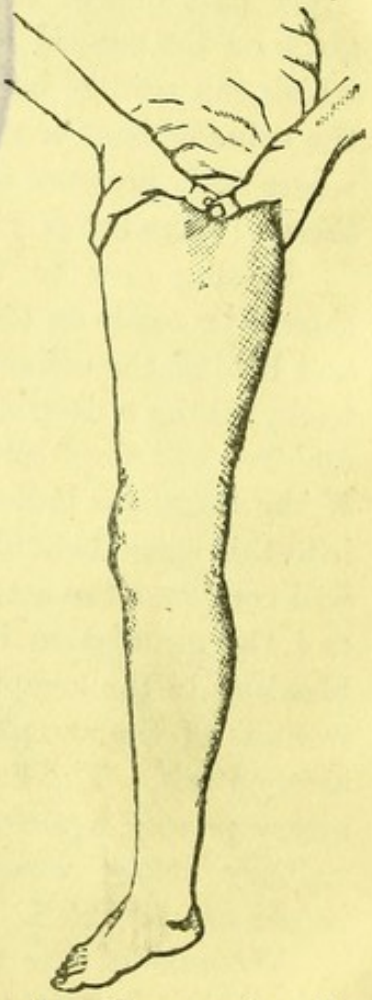

Fig. 11.—Compressing the artery of the thigh.

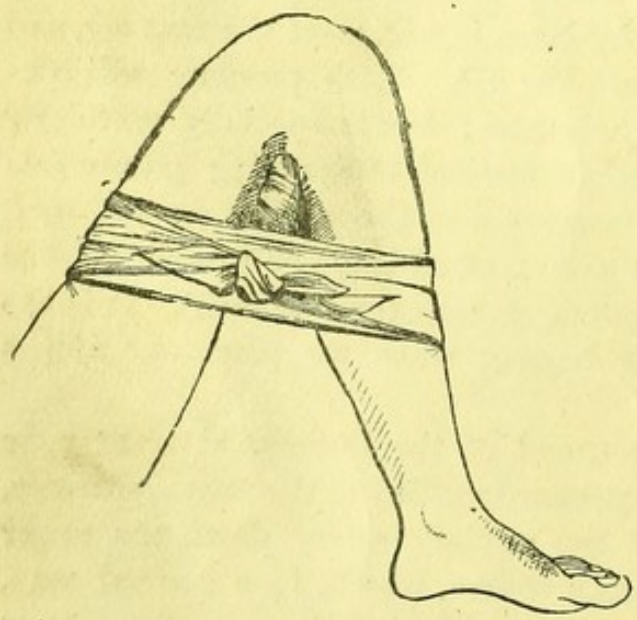

Fig. 12.—Compress applied to the ham to check bleeding in leg or foot.

be placed in the bend of the elbow; the forearm is then to be bent on the upper arm (the palm of the hand being turned forwards) and the forearm and upper arm are then to be bandaged together, as shown in Fig. 10. In this way pressure is made on the blood-

vessels as they pass to the forearm, and bleeding from any point below is at once checked.

As regards the hand itself, we may readily stop bleeding in the hand by compressing the radial artery (or that in which the "pulse" is felt) on the thumb side of the front of the wrist, and the ulnar artery, its neighbour, on the side of the little finger. The pressure in each case is to be applied about a couple of inches above the wrist on each side, as marked in Fig. 7.

In dealing with wounds of the thigh and leg, the distribution of the arteries again falls to be considered. Thus, the *femoral artery*, or that of the thigh, enters the leg in the centre of the groin. It lies near the surface for three or four inches of its course, and can easily be felt beating through the skin. The artery can, therefore, be readily compressed in this situation; namely, on the inside of the thigh at its upper part. Further down, the femoral artery passes inwards, and is then found in the back of the thigh, so as to become the artery (*popliteal artery*) of the "ham," which is the space behind the knee. Here the vessel divides into two branches. One passes down the front of the leg, or shin, but lies deep, until it reaches the ankle, where it can be felt beating on the front of the instep and towards the back of the foot. The other goes to the back of the leg, where it is also well protected, but near the ankle comes to the surface likewise, and may be felt behind the ankle on the inside, as it passes to supply the sole of the foot. In both arm and leg we thus see the main artery of the upper limb dividing at the joint (elbow and knee) into two main trunks, and coming to the surface as they approach foot and hand respectively.

For bleeding in the lower part of the thigh or leg, the *femoral artery* may thus be compressed, as shown in Fig. 7 (above s), while in Fig. 11 the act of applying pressure to this vessel is depicted. For wounds of the leg below the knee a very handy way of arresting bleeding is shown in Fig. 12, where the procedure already alluded to in the case of the elbow is repeated. A pad, small below and graduated so as to make firm pressure on the popliteal artery in the "ham," is placed in the latter space. The leg is next bent on the the thigh so as firmly to compress the pad and artery, and is then bandaged, as shown in the illustration, to the thigh.

For the control of arterial bleeding in the foot the foregoing method will be found serviceable, but pressure may also be made, if more convenient, on the arteries already described as coming to the surface at the ankle, and in the situations indicated in Fig. 7

at v. Pressure may be applied behind the inner ankle, and on the front of the instep towards the heel.

Having seen how the ambulance student should make compression of a wounded artery his first care on being called to a case of hæmorrhage, by way of at once arresting the flow of blood and of thus conserving the patient's strength, we may now pass to the consideration of the subject of *tourniquets*. These are appliances for the arrest of arterial bleeding. A *tourniquet*, whatever be its nature, is intended to apply compression to an artery for any length of time that may be required. It is seen in this way to provide a supplementary means of controlling bleeding to that we find in our fingers and thumbs in the first instance.

Suppose the student called into a case of severe wound of the forearm. He at once recognizes that an artery or arteries have been wounded by the spurting of the blood in jets, and by its light red colour. At once his thoughts rush to the means of controlling this waste of the vital fluid. He knows that two methods await his behest. He may, as just described, place a pad in the hollow of the elbow (Fig. 10), bend the forearm on the upper arm, and bandage it in that position; or he may, as we have also seen, compress the main vessel (the *brachial artery*) in the upper arm with his fingers (Fig. 9), and control and cut off the supply of blood to the wounded parts below. His next care will be to look about for a substitute to replace his fingers in the latter case. This substitute is a *tourniquet*, and this appliance may be of various kinds—simply and readily made, or complex and derived from the surgeon's *répertoire*, as the case may be.

Of whatever materials a tourniquet may be made, it must include three conditions or parts. There is, firstly, a *bandage* of one kind or another; there are, secondly, *means for tightening this bandage at will*; and there exists, thirdly, *a pad or compress*, which is intended to replace the fingers that are pressing on the artery.

The handiest tourniquet which can be made is that constructed of (1) a pocket-handerchief, of a leather strap, of a brace, of a triangular bandage, of a necktie, or of any other similar material; (2) a piece of cork or wood, or a small stone by way of compress; and (3) a piece of stick wherewith to twist the bandage (as a drayman twists the ropes over his barrels with a rack-pin), and thus to exercise great pressure at will.

In Fig. 13 we see such a tourniquet applied to a limb. Here the compress (on the brachial artery of the upper arm) is a piece

of wood; a handkerchief forms the bandage, and a piece of stick is the twisting lever. The stick (a pencil can be used if no other means is at hand) can be tied in position so as to keep the tourniquet tightly applied to the limb, and a patient thus attended to may, if need be, be conveyed for miles in safety to a surgeon to have his wound surgically treated.

Other forms of tourniquets are depicted in Fig. 14. Here, on the femoral artery of the left leg, a *Petit's tourniquet* has been

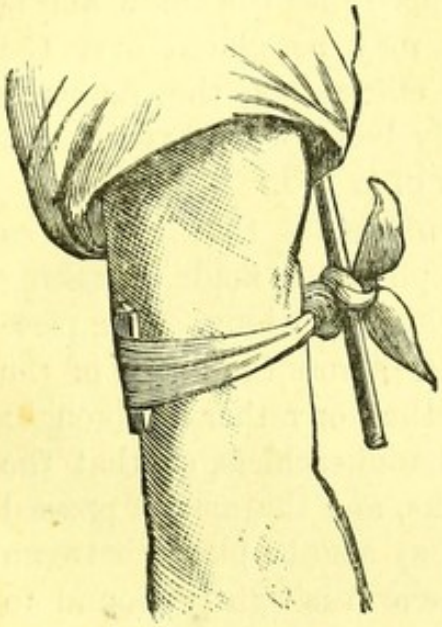

Fig. 13.—Improved Tourniquet.

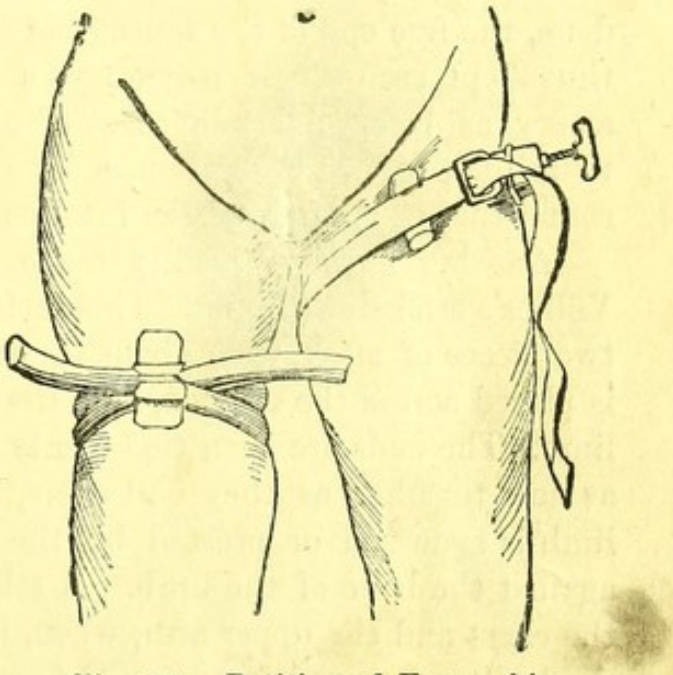

Fig. 14.—Petit's and Esmarch's Tourniquets.

applied. On the right leg, an *Esmarch tourniquet* is shown in position.

Petit's tourniquet consists of two plates of brass, connected by a screw moved by the handle seen in the figure. A strap (and buckle), with a pad attached, also shown, is made to pass between the two brass plates or holders, and can be adjusted to suit any size of limb. In applying this tourniquet, we see that the pad is placed over the artery to be compressed; while, if a separate pad, (as shown in the drawing), be used, it is placed in the proper position. The belt is then drawn tight, and firmly buckled over the pad. Then, by turning the screw, and separating the brass holders of the tourniquet, we bring additional and easily graduated pressure to bear on the pad through the consequent tightening of the strap; and the blood-vessel can, therefore, be controlled by any degree of tightness we choose to exert.

The Esmarch tourniquet, shown in position on the right thigh, is much more simple in its application. Here a rounded piece of india-rubber is employed. Upon the india-rubber is fixed a wooden or metal catch. The india-rubber will only pass into the catch when it has been made slender by being extended, so that once in the catch it holds itself fast by its own recoil. In applying this tourniquet, therefore, all that is required is rapidly to wind the india-rubber tubing round and round the limb between the wound and the heart, so as to compass the limb very tightly. This being done, the free end of the tourniquet is slipped into the catch, and is thus kept secure. If necessary, a pad may be placed over the artery as before; but in cases of great emergency, the Esmarch tourniquet can be used at once by simply being wound round and round the limb, without the intervention of a pad.

Another form of readily made tourniquet is that known as Völker's stick-tourniquet. This latter appliance is made by taking two pieces of stick, each about six or eight inches long. One piece is placed across the outside, and the other across the inside of the limb. The ends are then tied firmly together, or rather are brought as near together as they will come, by handkerchiefs, so that the limb is squeezed or pressed by the sticks, and the artery pressed against the bone of the limb. A stick may also be placed between the chest and the upper arm, when, if the arm is tightly bound to the body, pressure is made on the artery as before.

The question naturally arises, "How long may a tourniquet be kept in position on a limb?" The reply to this query depends upon the circumstances of the case. In most cases it will be wise to leave the tourniquet, after the bleeding has been controlled by its application, in its position until the surgeon arrives. If his advent is long delayed, and the bleeding has entirely ceased, the tourniquet may, after, say, two or three hours have elapsed, be slowly, and cautiously, and slightly loosened. The eye of the observer is to be kept on the wound, and on the least appearance of bleeding the tourniquet is at once to be tightened, and the bleeding controlled. If, however, no bleeding recurs after the tourniquet has been loosened, it may be allowed to remain so, *but the patient must be carefully watched, and on no account left, even for a moment; inasmuch as, on the first sign of recurring hæmorrhage, the tourniquet will require to be tightened.* On this account, a tourniquet *should never be taken off the limb, but kept in position, ready, if necessary, for re-application.*

A concluding caution in the matter of the treatment of wounds may be given in the shape of the advice that where any doubt exists in the mind of the student regarding the nature of a wound —that is, whether it is arterial or venous—he should err on the safe side, and treat the wound as if it were the more serious of the two, namely, an *arterial* one. A tourniquet, or compression with the fingers, should be at once, in doubtful cases, made on the nearest main blood-vessel or vessels, as already described. If the injury is one in which an artery is involved, it will thus be at once attended to, as the urgency of the case requires. If a vein has been wounded, the case is not of such urgent nature, and the delay incurred in ascertaining the exact extent of the injury and in applying the tourniquet will be immaterial.

A second piece of advice is that which counsels the ambulance student to see and to examine each wound for himself. If cloths or clothes obscure his view, let those be removed. "Never work in the dark," in the matter of wounds, is a rule ever to be borne in mind. If clothes are in the way, never hesitate to cut or tear them off. The bystanders are always on the side of economy, because they do not realize that "life is more than raiment," in this sense. Therefore, rip up the clothes, whenever necessary, with knife or scissors, always remembering that your object is to save time and to control bleeding with the least possible delay.

CHAPTER VIII.

THE TREATMENT OF BROKEN BONES—THE SKELETON AND ITS PARTS.

In pursuance of the common-sense rule that a knowledge of the structures and parts which are involved in an injury forms the basis of all rational ambulance treatment—as, indeed, such information constitutes the basis of medicine itself—we must now proceed to form an idea of the *skeleton* and its construction as a preliminary to the study of broken bones and how to treat them.

The *skeleton* of man (Fig. 15) may be said to consist of two chief parts. These are the *axial part* or trunk, and the *appendages* or limbs. The "trunk" includes head, chest, and abdomen or pelvis, while the "limbs" are articulated to this central portion.

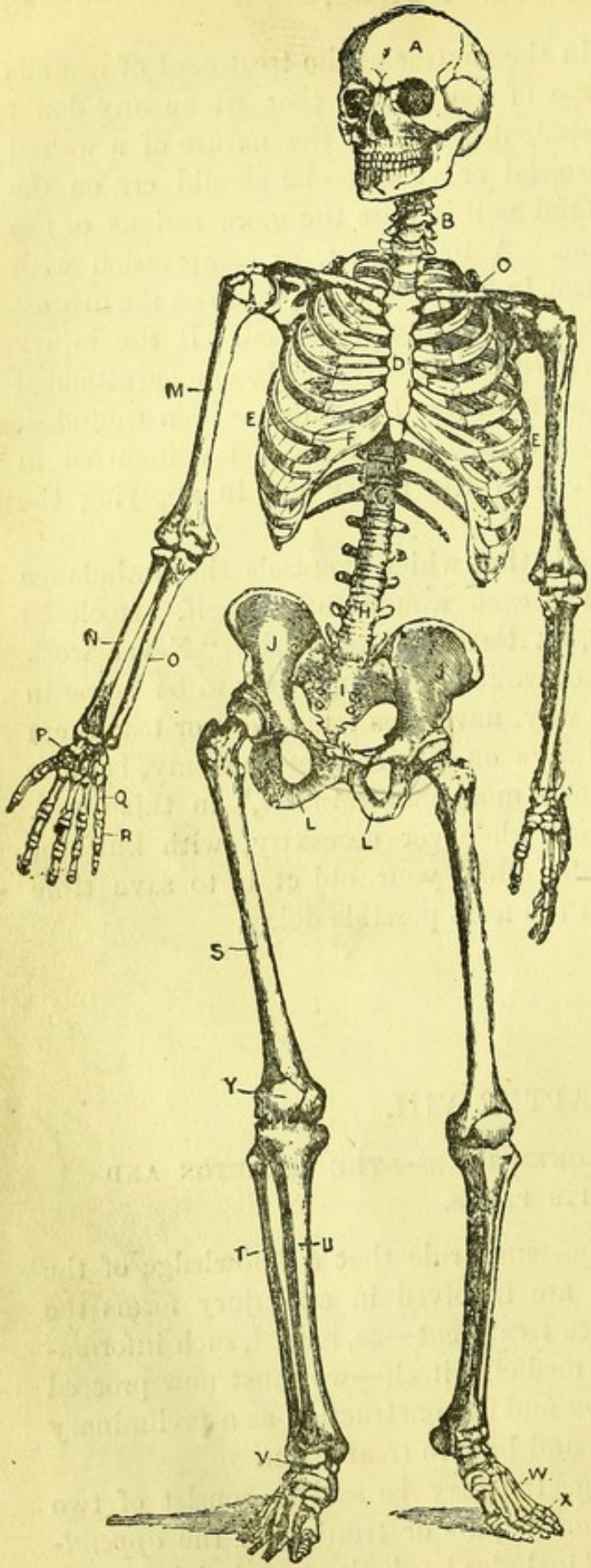

Fig. 15.—The Adult Male Skeleton.

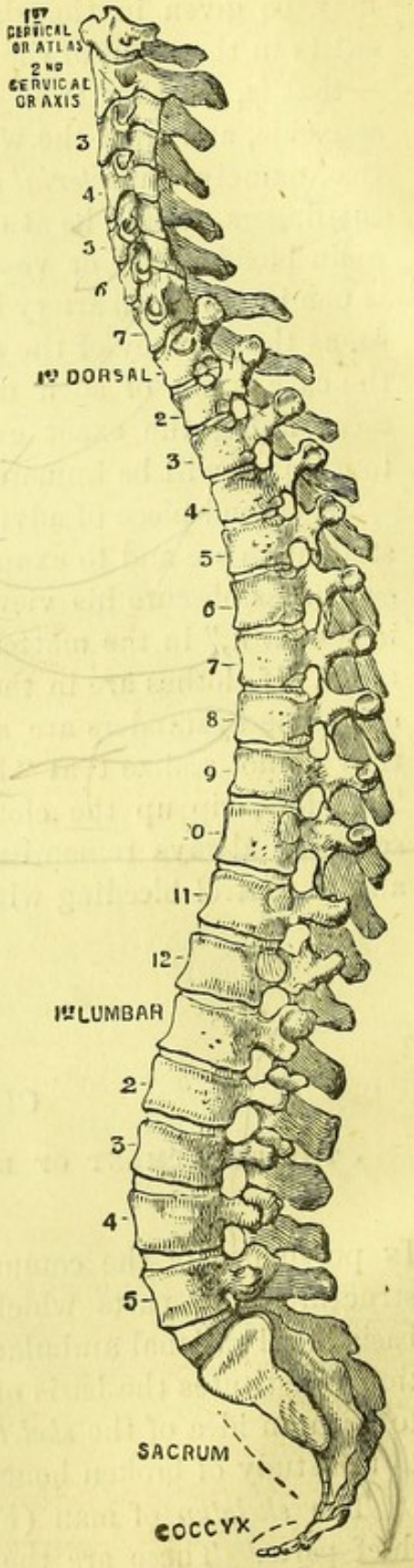

Fig. 16.—The Spine, viewed from the left side.

The spine itself (Fig. 16) is seen to consist of a series of bones called *vertebræ*. There are thirty-three vertebræ in the human spine, arranged as follows: Seven in the neck (*cervical vertebræ*); twelve in the back (*dorsal vertebræ*); five in the loins (*lumbar vertebræ*); five in the *sacrum* (*sacral vertebræ*), which is a single bone wedged in between the haunch-bones behind; and four in the *coccyx*, or tail. The latter are small and rudimentary in their nature (see Fig. 16). The vertebræ are built up on a common type. Each (Fig. 17) consists of a solid piece or *body* (1); and of *processes* arising from the body. Thus we see the *spinous process* (4) behind; at the sides, the *transverse processes* (5), while certain processes called *articular* (7, 8) serve to lock or join each vertebra to its neighbours. The *atlas vertebra* (Fig. 18), or first of the neck,

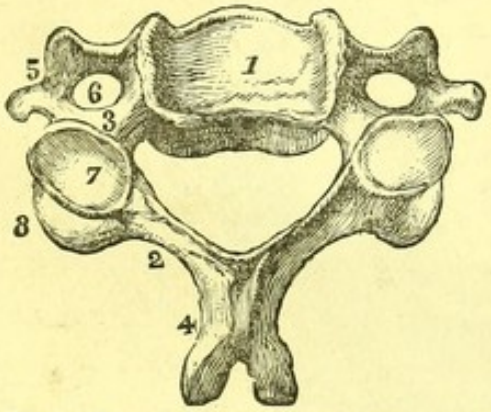

Fig. 17.—A Neck Vertebra, seen from above.

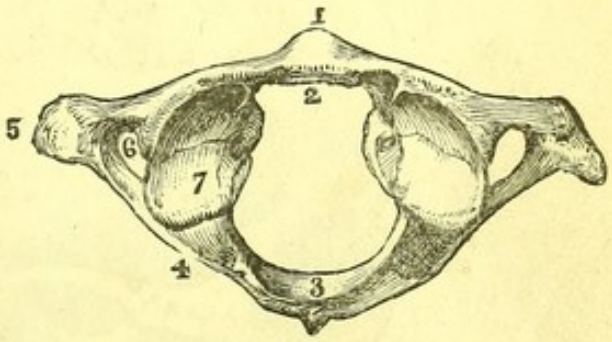

Fig. 18.—The Atlas, or first vertebra.

has no body, but has shallow cup-like surfaces (7) for receiving the processes by which it is connected to the skull.

The skull itself (Fig. 19) is composed of twenty-two bones. Fourteen of these form the *face*, while eight go to form the brain-case or *cranium* proper.

The *chest* or *thorax* (Fig. 15) consists of the *sternum* or breast-bone (D) in front, and of the twelve pairs of ribs. The first seven ribs are attached to the breastbone, each by a bar of gristle or *cartilage*, called a *costal cartilage*. The eighth, ninth, and tenth ribs usually join the *cartilage* of the seventh; while the eleventh and twelfth pairs of ribs spring from the spine behind, but are not attached in front. Hence the latter are often called *free* or *floating ribs*.

The *limbs* are attached to the trunk, each by a series of bones, called the *girdle* of the limb. In the case of the upper limb, we

find the *scapula* or *shoulder-blade* (Fig. 20) a triangular bone, lying on the back of the chest, at its sides and upper part. The arm is attached to the shoulder-blade, and to that part of it called the *glenoid cavity* (see Fig. 20), so that it is at this spot that the shoulder-joint is found. The second bone of the human shoulder-girdle is the *clavicle* or *collar-bone* (Fig. 15, C); which, extending from the *acromion process* of the shoulder-blade (Fig. 20) to the breastbone, forms the keystone of the shoulder-arch.

The arm, or fore limb, consists, as we have already noted, of, firstly, a single bone, the *humerus* (M), which extends from the shoulder to the elbow. Above, the humerus has a round head,

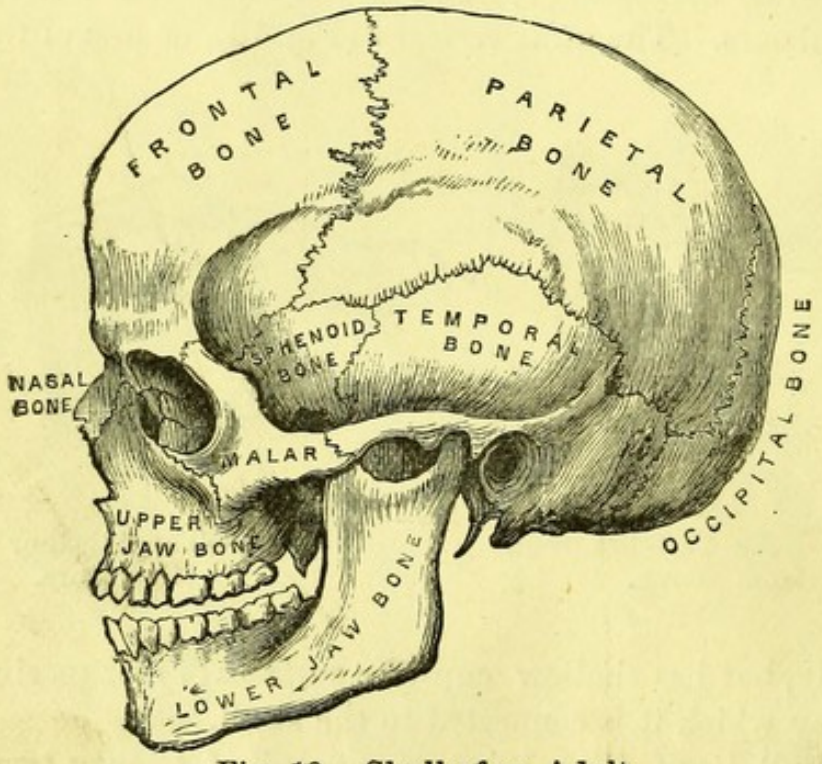

Fig. 19.—Skull of an Adult.

which fits into the shallow "glenoid cavity" of the shoulder-blade. The rest of the bone includes the *shaft*, or column, and below, it shows a pulley-like surface, which fits into the hollow of the ulna (O) of the forearm. Looking at the figure of the skeleton, and at the forearm of the right limb, we see that the *radius* (N) and the *ulna* (O) of the forearm lie side by side. In this case the radius lies to the thumb side of the arm, the palm of the hand pointing forwards—whilst the ulna lies to the side of the little finger (R). In this position, which is named *supination*, the bones therefore occupy what may be termed their natural position. If we keep our arm in this position, with the palm directed forwards or up-

wards, the radius and ulna thus lie side by side. But we possess a useful habit of at once reversing this position of the palm. In an instant, we can direct the palm of the hand downwards or backwards. Now, "this turn of the wrist," as it is popularly named, is really effected by the radius (N) rotating or runn ng round the ulna. When our palm is downwards or backwards, the radius therefore crosses the ulna, as shown in the left-hand arm of the skeleton. In this latter, or crossed condition of the bones, they are said to be in *pronation*.

The *radius*, then, in its natural or uncrossed position, lies to the thumb-side of the limb. It has a rounded head above, and is

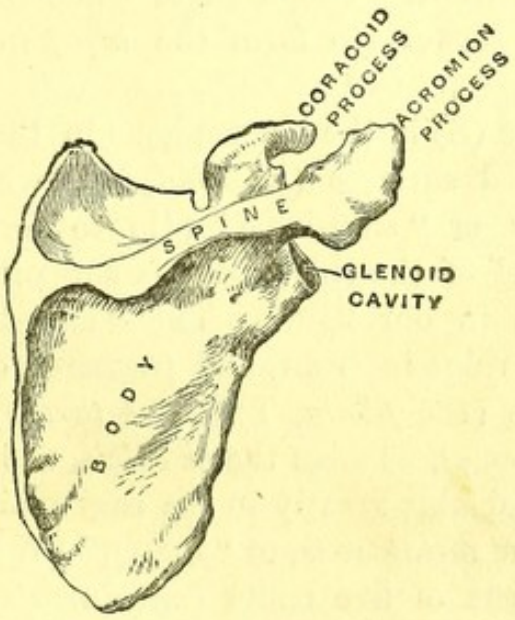

Fig. 20.—The Right Shoulder-blade, seen from behind.

broadened out below, where it joins the wrist-bones, or *carpus* (P). The *ulna* (O) shows a deep hollow above, where it receives the pulley-like end of the humerus (M); and below a small pointed projection (the *styloid process*) exists. In some animals (*e.g.*, the bat, cow, horse, etc.) the ulna is very rudimentary; whilst in birds, the radius is the smaller of the two bones. In such animals as the dog and elephant the radius and ulna exist permanently in the crossed position, or that of *pronation*, while apes and sloths can alter the position of these bones as freely as man.

The *carpus*, or "wrist" (P), of man is composed of eight bones. Birds have but two wrist-bones, but the necessity for a movable wrist does not exist in birds, as we have already seen. Succeeding the "carpus" is the palm (Q), or *metacarpus*, consisting of five "metacarpal" bones; and to these succeed the fingers, or *digits*,

all, save the thumb, being composed of three small bones, called *phalanges*. The thumb has but two of these bones.

The lower limb of man corresponds with the hind leg of other animals. The *pelvis*, or "haunch," is composed in adult life of two bones (the *innominate bones*), which meet in front, and which have the *sacrum* (I) wedged in between them behind. But in early life—and, indeed, up to the period of manhood—each "innominate bone" is found to consist of three distinct bones. These are, the *ilium* (J), which forms the "haunch" proper, and which joins the sacrum; the *ischium* (L), or lower part, on which the body rests in sitting, and the *pubis* (K), or bone which joins its neighbour of the other side in front. The head of the *femur*, or thigh-bone works in a deep socket (to form the *hip-joint*) known as the *acetabulum*.

The thigh-bone (S) is the longest bone in the body, and below, shows two rounded surfaces (its *condyles*), which move on the head of the *tibia* or "shin-bone" (U) to form the knee-joint. Above, the "head" of the thigh-bone is supported on a prominent "neck," as shown in our figure. The "shin-bone" (U) has the well-known sharp ridge in front, and possesses, on its outer side, a long slender bone (the *fibula*, T). The *tarsus*, or "ankle" (V), consists of seven bones, whereof the *os calcis*, or heel, is highly prominent behind, and aids greatly in the easy maintenance of man's erect posture. The *metatarsus*, or "instep" (W), like the "palm" of the hand, consists of five bones (*metatarsals*), and the toes, or *digits* of the foot, possess the same number of *phalanges*, or separate bones, as do the fingers.

The *patella* or "knee-cap" (Y) is a *sesamoid bone*, this name being given to bones which are developed in the sinews or tendons of muscles. The other bones are not so developed; and "sesamoid bones" of small size are not uncommonly found near certain of the joints of toes and fingers.

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CHAPTER IX.

HOW TO TREAT FRACTURES OR BROKEN BONES.

THERE are few subjects a correct knowledge of which is of more value to the ambulance pupil than that of fractures. Their prompt recognition and early treatment are of the first importance for the well-being of the patient, and when we take into account the fact that they are liable to happen in the most unlikely places—frequently far away from where a medical man can be readily obtained—it is evident that much needless suffering is certain to be endured if injuries of this description are either left unattended to or unskilfully dealt with.

A few years ago, owing to the prevalence of untrained hands and defective methods of transportation, instances were not uncommon of simple fractures being rendered compound, but it is pleasing to be able to add that, since a knowledge of ambulance work has been infused throughout the great centres of labour, and ambulance waggons placed at the service of the community, examples of this kind are comparatively seldom met with.

In order to discuss the subject of fracture thoroughly, and, at the same time, with that degree of lucidity which is essential for a perfect understanding of the matter, it seems to me expedient to consider it under four heads. These are as follows:—

I. The definition of a fracture, and of the causes which lead to its production.

II. The various kinds of fracture.

III. The signs of fracture.

IV. The treatment of fracture.

I. THE DEFINITION OF A FRACTURE, AND OF THE CAUSES WHICH LEAD TO ITS PRODUCTION.

A fracture may be defined as the breaking or snapping of a bone or bones, this breaking or snapping—or "solution of continuity," as it is technically termed—being effected either through he medium of *direct* or *indirect violence.*

A fracture is said to be brought about by *direct violence* when the force or forces which have led to the production of the injury have been applied exactly at the spot where the bones have given way. No better example of this could be given than that of a carriage wheel or cart wheel passing over the bones of the leg and breaking the tibia and fibula at the point where it came in contact with them. In the same way, a heavy body, such as a brick or chimney-can, falling from a height and in its descent smashing one or other of the bones of the skull is, perhaps, as convincing an example of a fracture brought about by direct violence as could be laid before you. When a fracture is due to the action of indirect violence, the force which has occasioned the mischief is applied at a distance from the seat of fracture; and the bones are compressed to such an extent between a resisting medium on the one side and the weight of the body on the other, that they give way in consequence of the strain which is brought to bear upon them.

One of the best illustrations of this which could be brought under your notice is that of a fracture of the leg or thigh produced by jumping from a railway train while in motion. In such a case there are three factors called into operation, and these are: (1) The velocity of the train; (2) the ground; and (3) the weight of the body. If any one jumps from a railway train while going at a certain rate of speed, it is evident that in doing so he must acquire the momentum of the train in question, and will therefore be shot forward with an impetus corresponding to this momentum. Immediately after jumping, the further progress of the individual is barred by the ground—the solid resisting medium on the one side, while simultaneously the third factor (the weight of the body) comes into play by compressing the bone or bones between the ground below and its own weight above, and in consequence of the pressure which is brought to bear upon them they give way either at their greatest convexity or at their weakest point.

A fracture of the forearm is frequently produced by a fall on the hand, the radius being usually snapped across about an inch above its lower end as a result of the undue compression which in this way comes to be exercised upon it. Muscular action is also occasionally the cause of fracture, and there are instances on record where the clavicle has been broken by a back-handed blow. The patella is often divided in two by violent muscular effort.

II. THE VARIOUS KINDS OF FRACTURES.

1. SIMPLE.—*Green-Stick; Impacted.* 2. COMPOUND.—*Comminuted.*

Fractures are divided into two great classes, the *Simple* and the *Compound.*

In the *Simple* fracture the bone is broken, but there is no external wound, the skin over the seat of fracture remaining intact.

In this class may be included the *Green-Stick Fracture* and the *Impacted Fracture.* In the *Green-Stick Fracture* the bone becomes bent. It is only seen in children, and cannot take place after the osseous tissue has undergone hardening. In the *Impacted* species (*impactus*, from *impingo*, "I drive in") the one end of the bone is driven into that of the other and remains fixed there.

The *Compound Fracture* is one where, in addition to the bone being broken, there is a wound leading from the skin to the seat of fracture and communicating with the atmosphere. On this account a compound fracture constitutes a graver form of injury than a simple one, owing to the chances of decomposition occurring within the wound. Fortunately, however, the dangers in this way have been greatly lessened since the introduction of the Antiseptic system; but ambulance pupils will be best able to realize what a boon the Listerian method of wound-treatment has proved to surgery when I tell them that twenty or thirty years ago the treatment adopted in the majority of compound fractures was amputation of the limb; it being found by experience that the rate of mortality was lowest when this course was followed.

In the *Comminuted* variety (*con*, "together," and *minuo*, "I lessen") the bone is reduced to a number of fragments. It usually accompanies the Compound Fracture, and is almost invariably the result of severe direct violence.

III. THE SIGNS OF FRACTURE.

The *signs of fracture* are of the utmost consequence, and an intimate acquaintance with them greatly facilitates the detection of an injury of this kind. The more important of them may be enumerated as follows: 1. *Pain.* 2. *Inability to use the affected limb or part of body which has been injured.* 3. *Swelling.* 4

Change in the shape of the parts. 5. *Unusual mobility of the parts.* 6. *The detection of crepitus.*

The first and most obvious sign of fracture is *pain.* It is a well-nigh constant symptom, though its intensity varies with the susceptibility of the individual. A noteworthy point in connection with this symptom is that in the majority of instances it is accurately localized.

The second sign, and one which we rarely fail to observe, is an *inability to use the affected part.* If an arm or forearm be broken, it is seldom that the individual can put his hand to his head, and any attempt to do so is almost certainly futile. In the same way, if a leg be broken, locomotion is impossible, and the patient speedily finds that attempts at progression are attended with excruciating pain. When a person has sustained a fracture of the ribs, it is commonly found that the drawing of a long breath is accompanied by what is termed, "a stitch in the side," and which, to those who are unfamiliar with this particular class of injuries, may be described as an acute lancinating pain, caused by the sharp spiculæ of the broken end of the bones pressing where they ought not to do so.

Swelling is a symptom which, unless in exceptional circumstances, seldom manifests itself at the time of the accident. If the limb, however, has been allowed to remain for some time unattended to, or be unskilfully handled, swelling is likely to follow. It is caused by effusion of blood into the tissues surrounding the broken bone, and allowance must be made for it in the subsequent treatment.

Change in the shape of the parts furnishes valuable evidence in regard to the existence of fracture, because a marked deformity in a limb can only arise from the displacement of the broken ends of the bones. In some cases this is so striking as to afford ocular proof of the presence of fracture; but when it is not so well marked, comparison of the limbs—of the sound with the affected one—is a valuable aid towards diagnosis, and points of difference are in this way brought clearly out which, but for the contrast, might have escaped observation. The length of the limb may come to be interfered with; and if we have over-lapping of the ends of the bone—as frequently is witnessed in fractures of the thigh—shortening of the limb necessarily ensues. Displacement of a bone may be caused by direct violence, as when a portion of the skull is driven inwards by a blow; but as a rule, it is due to a combination of gravity and muscular action. In a typical fracture of the thigh, occurring in its middle third, we have almost invariably

shortening of the limb and eversion of the foot; the first being due to muscular action, and the second to the force of gravity.

Unusual mobility of the parts is a striking characteristic of broken limbs. If we subject the suspected limb to manipulation, we find there is flexibility where none ought to exist; and in carrying out this process we quickly detect the sixth and last sign of fracture—crepitus.

Crepitus may be described as the grating between the broken ends of the bones, and when it is elicited, we have convincing evidence of the presence of fracture. It may, in short, be designated the crucial test of fracture.

IV. THE TREATMENT OF FRACTURE.

In the treatment of fractures there are two main objects which we must constantly keep in view. These are (1) the replacing of the broken bones in the position which they ought naturally to occupy, and (2) their retention there until a satisfactory union has taken place between the ends. In order to accomplish the first of these—the replacing of the broken bones in the position which they ought naturally to occupy—we extend the limb, or, as the literal interpretation of the term implies, we stretch it out. By this means the fragments, in the great majority of instances, are restored to their proper place. In extending an arm or forearm we pull upon the hand, and in performing a similar office for the leg or thigh we pull upon the heel. "Counter-extension" is a force or weight applied in an opposite direction. For example, if we extend the forearm by pulling on the hand, we can at the same time practise "counter-extension" by fixing the elbow-joint, and when extending the leg or thigh the weight of the body usually proves a sufficient counter-extendent.

Having reduced the fragments, we must endeavour to retain them accurately together by means of splints until bony union between their ends has been established. Splints vary in shape according to the limb with which we have to deal, but they ought to be of sufficient length to fix the joints on either side of the break. In a fracture of the forearm, we require to render the wrist and elbow-joint immovable. Movement of either leads to displacement of the ends of the fragments. In the same way the ankle and knee-joint must be securely held in fractures of the leg,

as movement of these would be prejudicial to a good result. The extension of a fractured limb should be kept up until the splints are properly affixed. Neglect of this precaution often entails after trouble, and it is well to bear in mind that any sudden jerk inflicts needless suffering on the patient. In order to obviate these complications, it is advisable that one person should give his undivided attention to the injured limb. A second ought to hold the splints in position, while a third can apply the bandages. In this way the work will proceed smoothly, and the patient will be

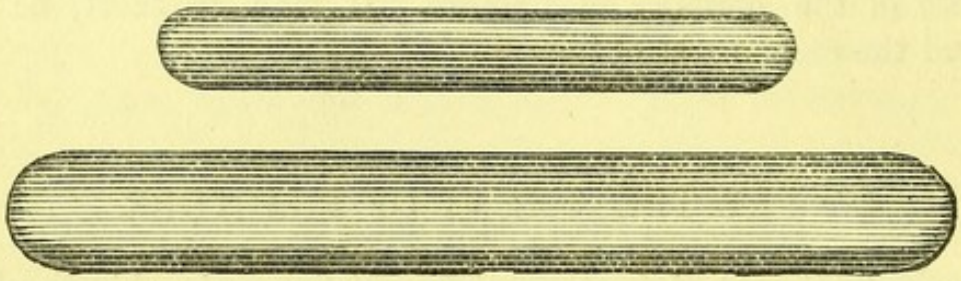


Fig. 21.—Splint suitable for Broken Forearm.[1]

Fig. 22.—Splint frequently used for Fracture of Leg. Two ought to be used, and the other is exactly similar.

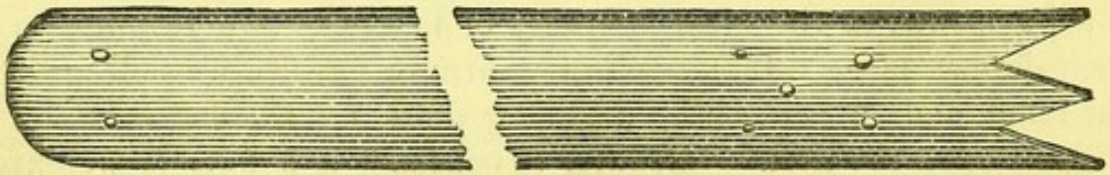


Fig. 23.—Thigh Splint.

spared unnecessary pain. After everything is adjusted, care should be taken to see that the circulation is going on in the extremities. If it is not, the probability is that the bandages are unduly compressing the limb, and they should therefore be slackened without delay.

Bony union must always be aimed at. Occasionally, when movement of the broken ends is permitted during the healing stage, we have ligamentous instead of bony union taking place. When this complication ensues there is then what is termed a *false joint*—a state of matters which renders a limb practically useless.

[1] The longer splint is best applied to the outside of the forearm. The shorter to the inside.

Such are the usual methods of treating fractures; but ambulance pupils must at all times be prepared to put up broken limbs with extemporized material, because accidents frequently happen where splints (Figs. 21, 22, and 23) and bandages of the orthodox pattern are not at hand. For this purpose an immense number of articles of the most diverse character are available, and at a pinch it is wonderful what a little ingenuity frequently accomplishes. Anything which will give support to the injured limb without the imposition of much additional weight answers the end we have in view, and it is seldom, even in the most isolated spots, that something suitable cannot be obtained. Branches of trees, odd bits of wood, or sticks of some kind are, as a rule, readily procured in the country, while in every town house there are innumerable appliances of the simplest description, such as rolls of music, periodicals, newspapers, umbrellas, or walking-staves, which may be called into requisition. In the event of an accident occurring in the street during the course of the day, the nearest grocer is generally able to supply the lid of a soap or orange box, and the hatter or draper is never without a bandbox, any of which, when broken up, are easily moulded to a limb, and form capital splints.

The policeman ought to know how to make use of his baton, and to the trained members of the force information of this kind is specially valuable at night, when shops and other places of business are closed.

A cleverly designed splint-baton, which we hope before long to see regularly worn by the constabulary, has been recently brought out by Dr. William Macewen, of Glasgow. It consists of three parts (Fig. 24), and these, when lashed together, constitute a reliable weapon either for offence or defence (Fig. 25). The fact that it is composed of several pieces increases its strength, and at the same time presents the further advantage of being convertible into an admirable splint. When secured round an injured limb, it affords a much greater amount of support than the common baton, and the leather thongs which, under ordinary circumstances, bind it into one, form convenient substitutes for bandages (Fig. 26).

With such an implement in his belt, no policeman need ever be at a loss in treating a fracture of the leg or arm.

Accidents not infrequently happen on the parade-ground or at the sham fight, and if an ambulance squad is not attached to the regiment which is under arms, the volunteer can put up a

fracture of the thigh with his rifle, or a broken leg with his bayonet. When bandages are not forthcoming, it must be kept in mind that neckties, handkerchiefs, bits of twine or rope, bootlaces, etc., do almost equally well, and are readily available in nearly every

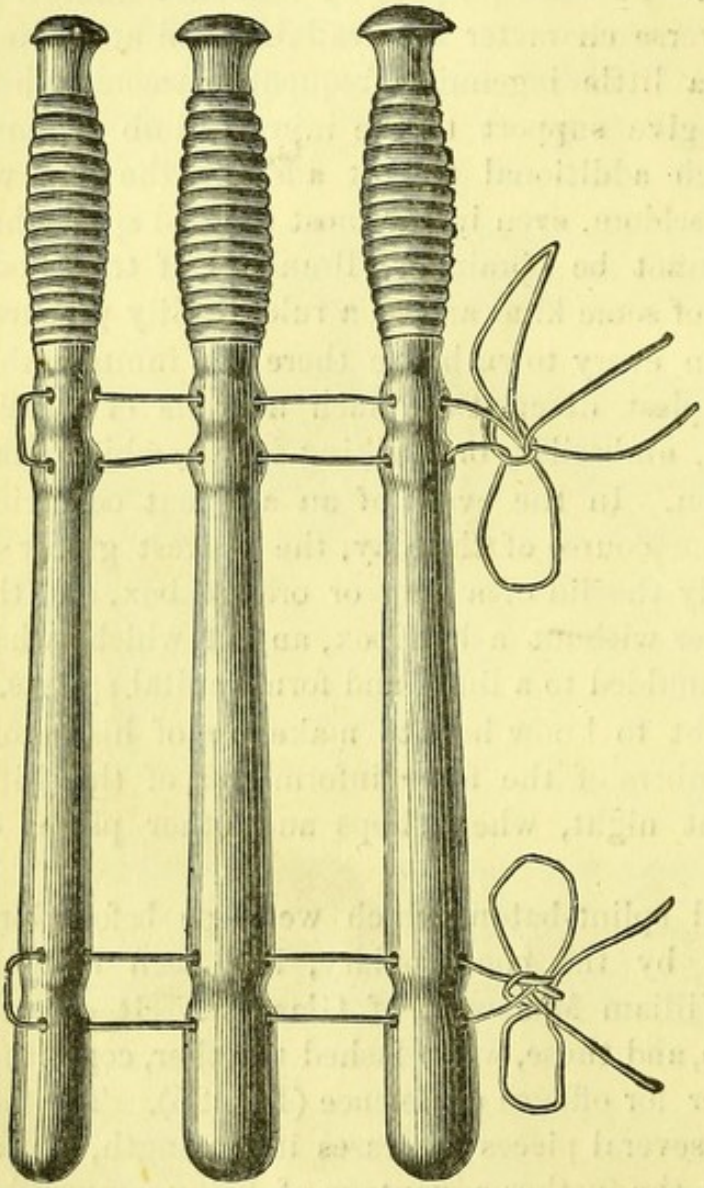


Fig. 24.—The "Ambulance Baton" when taken to pieces.

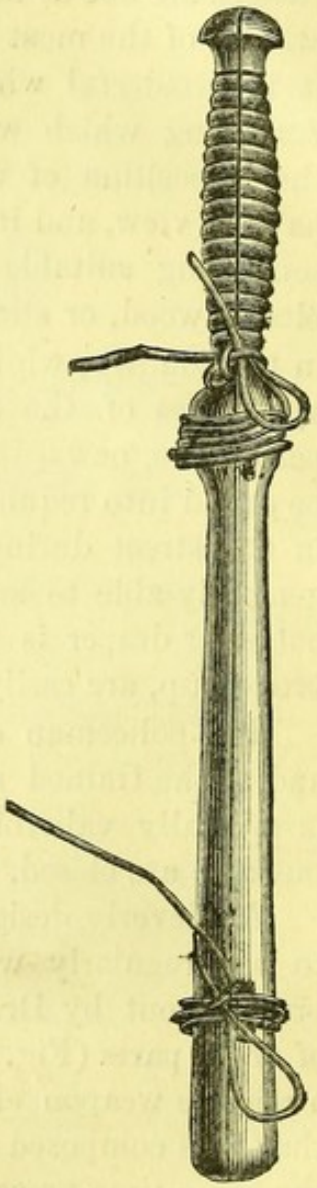


Fig. 25.—The Baton when put together.

situation. Did time and space permit, other instances might be adduced to show the extent and adaptability of extemporized material in the treatment of fractures, but the writer trusts that sufficient have already been indicated to give a tolerably clear idea of the many articles, comparatively simple in themselves, which can be improvised on an emergency and made to serve a useful purpose.

In dealing with fractures it cannot be too strongly reiterated—

even at the expense of repetition—that movement of a broken limb is attended with exquisite pain, and there ought, on this account, to be as little manipulation of the injured parts as possible. It

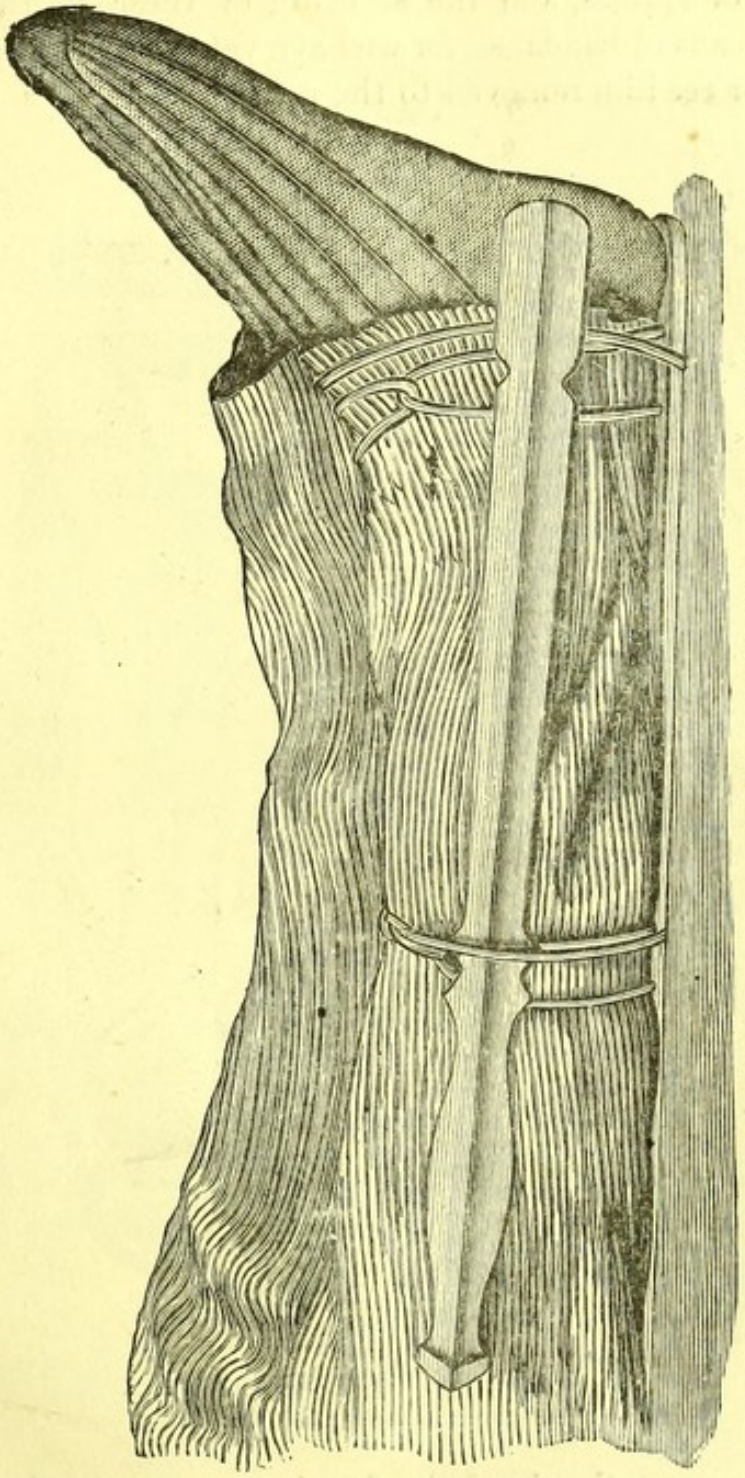


Fig. 26.—The Baton used as a Splint for a Broken Leg.

should also never be forgotten that the adoption of early remedial measures is of the utmost consequence, and the more promptly a lesion of this kind is seen to the better for the patient—hence the value of training the members of ambulance classes to utilize material which happens to be within their reach. Suffering is thus

reduced, and delay, with its aggravating complications, almost entirely avoided.

But the duties of the ambulance pupil do not end with the putting on of splints, and the securing of these in their correct places by means of bandages, for we have yet to convey the wounded man home or see him removed to the nearest hospital, and a correct

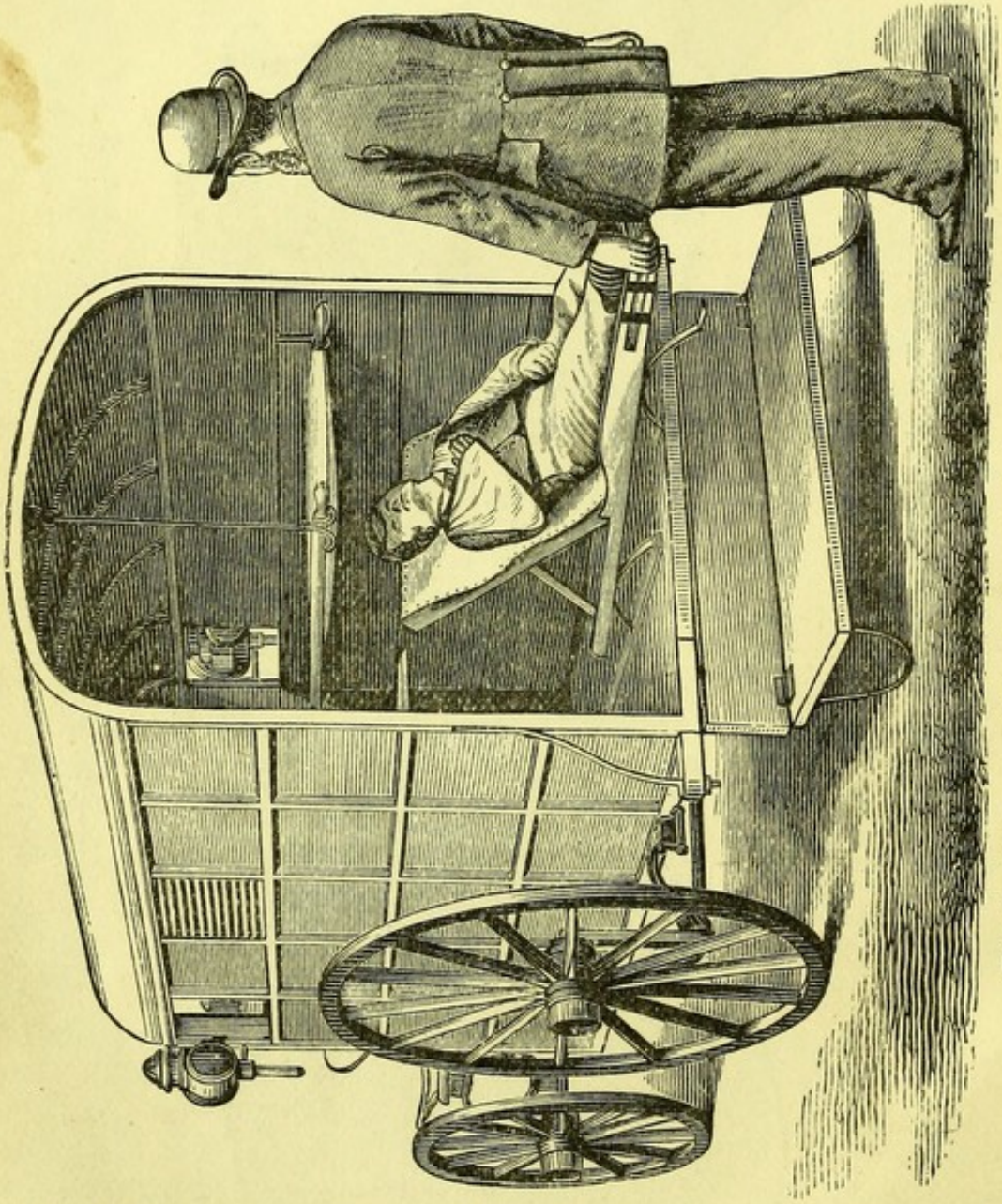


Fig. 7.—Waggon of Coatbridge Ambulance Association.

method of transportation is of the first importance in the class of cases now under consideration. With a fracture of the lower extremity, it is essential that the patient should be borne in such a way that he can lie fully extended on a flat surface. To drive any one suffering from a broken leg in a cab—unless, indeed, he be of small stature, and can enter as well as remain in a horizontal posi-

tion—is a mode of procedure which is much to be deprecated, and the getting of the unfortunate individual in and out of a vehicle of this kind is too often productive of excruciating torture. In the event of a properly-equipped ambulance waggon (see Figs. 27, 28,

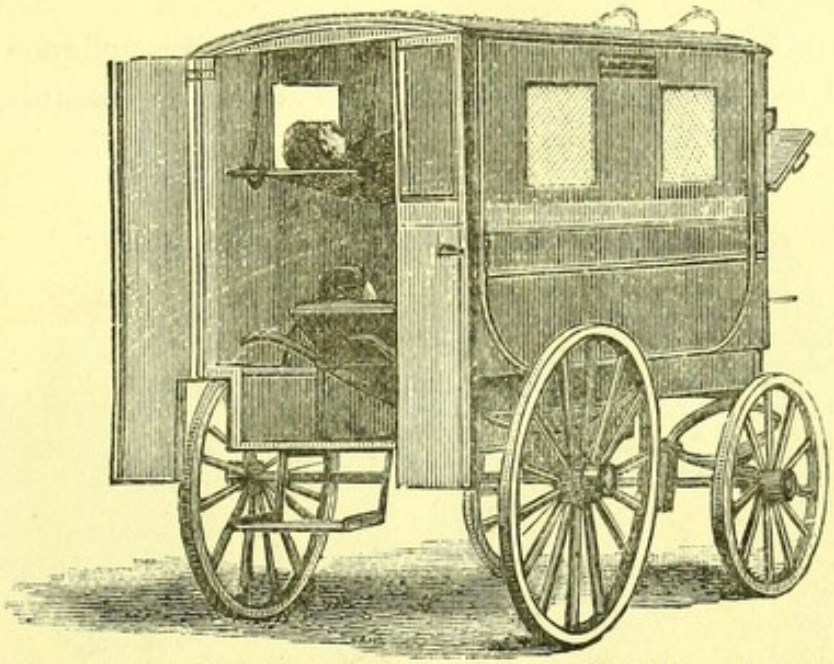


Fig. 28.—Waggon used in Newcastle-on-Tyne. (Built by Messrs. Atkinson and Philipson.)

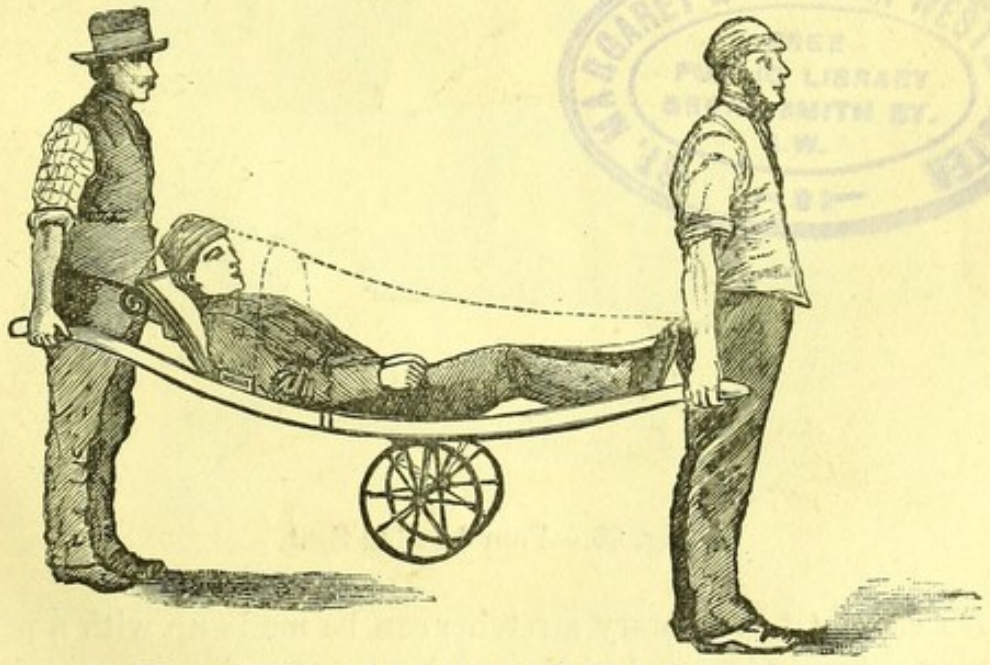


Fig. 29.—Stretcher used in Newcastle-on-Tyne.

and 29) not being within call, some measure must be devised to carry the injured person with as little discomfort as possible. Provided the distance is short, patients can be easily transported by means of bearers; but if much ground requires to be traversed, the plan soon

becomes laborious and troublesome, owing to the frequent changes which it involves. Fig. 30 shows the method adopted in forming the four-handed seat. Fig. 31 illustrates the two-handed seat, and Fig. 32 gives a good idea of the last-mentioned arrangement carried into practice.

If a stretcher can be obtained, it is the best appliance to work with, but in many situations shutters, ladders, deal boards, or gates require to be substituted.

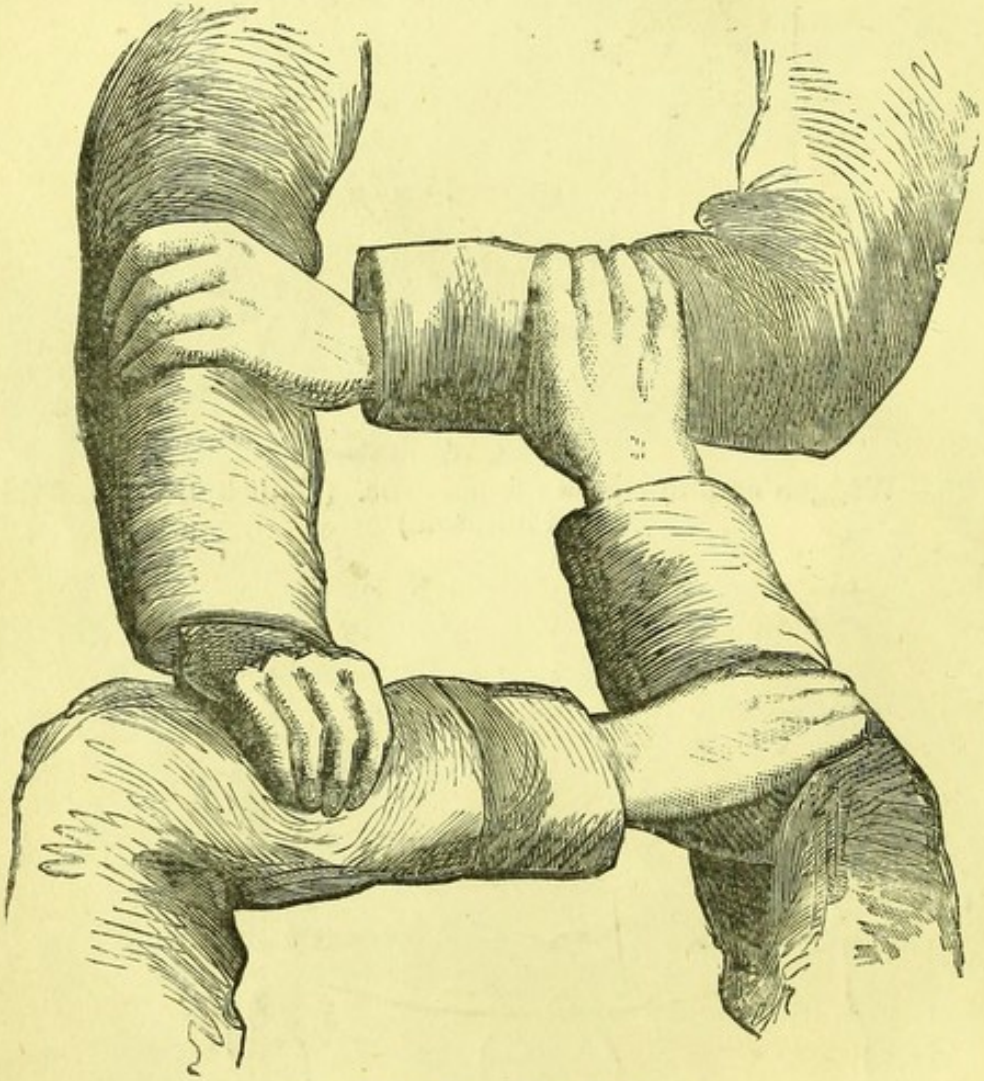


Fig. 30.—Four-handed Seat.

An excellent temporary stretcher can be made up with a pair of laundry poles, or broom-handles, and a couple of great coats. At a recent ambulance demonstration held in Glasgow, a very efficient litter was constructed of four waistcoats and a similar number of walking-sticks; while a lad who was supposed to have broken his leg was quickly removed on a lamplighter's ladder.

A stretcher is best manned by four bearers, who should, as far

as possible, be of the same height, one of the number (usually No. 4) being entrusted with the command of the detachment. In taking up a loaded stretcher the same precautions are necessary as in lifting and lowering the patient, the great object being to maintain the patient in one plane. The bearers at either end must remember to break step when setting out on their journey. When two persons "break step" they march out of step. No. 1 commences

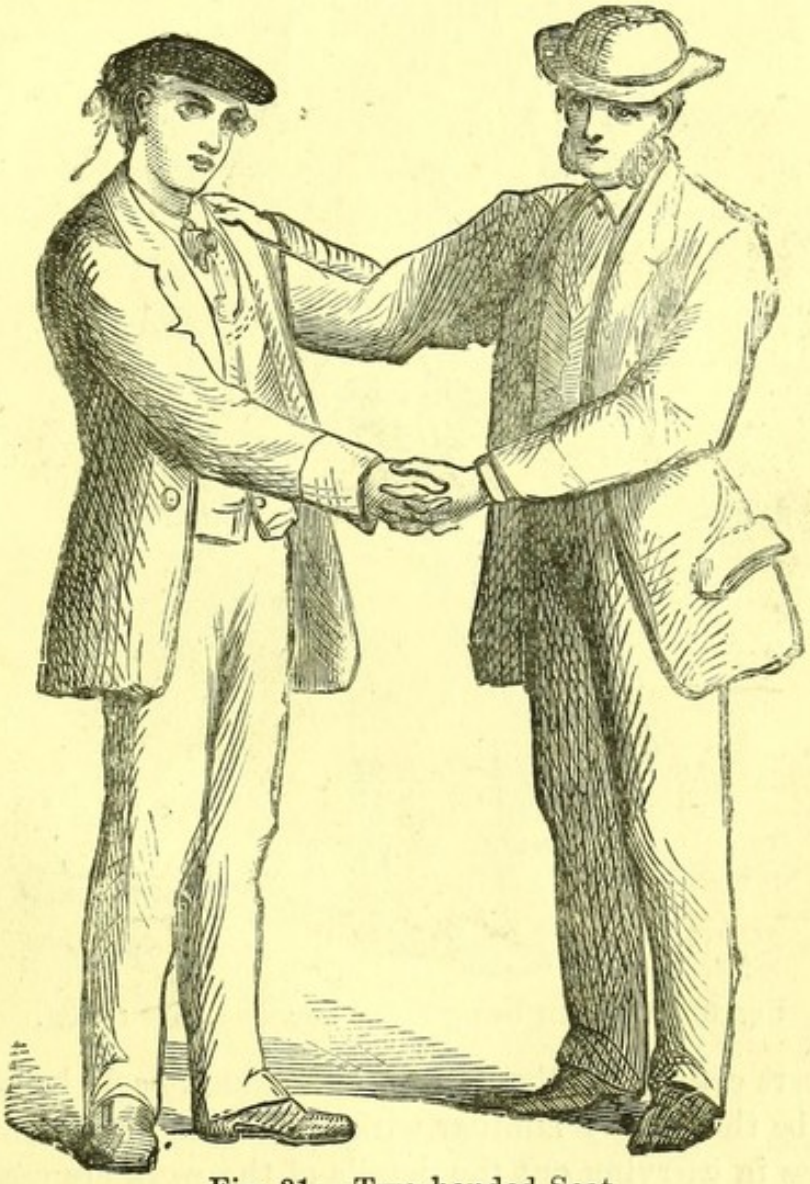


Fig. 31.—Two-handed Seat.

with the right foot, and No. 2 with the left, or *vice-versâ*. Should both follow the military rule of moving off with the left foot in advance, the patient will be more or less jumbled. In descending a hill, a patient with a fractured thigh or leg should be carried head foremost. This arrangement assists in the extension of the injured limb (the weight of the body acting as a counter-extending force), and by so doing promotes the ease and comfort of

the individual under treatment. For the same reason, in ascending a hill the positions are reversed.

In order that these minutiæ may be executed smoothly and efficiently, considerable training in stretcher-drill is necessary, and

Fig. 32.—Patient being borne on two-handed Seat.

the members composing the detachment should each be assigned a post, and be thoroughly familiar with the duties appertaining to it. Promptness in carrying out the details of the work are essential for the well-being of the patient, and if a number of untrained hands unaccustomed to work together are suddenly told off for such a duty mistakes are certain to happen, causing needless pain, and involving the risk of fresh complications.

In conclusion it need scarcely be added that in lifting the patient from the stretcher to the bed on which he is finally to repose the bearers must be careful to act in unison, in order to avoid movement of the affected limb.

CHAPTER X.

CAUSES AND TREATMENT OF DISLOCATIONS.

We have now to consider a class of injuries not unfrequently associated with, though differing essentially in their main features from, those we have just been considering. Our readers will recollect that fractures are met with principally in the long bones, all parts of the shaft being liable to breakage. But a *dislocation*, in the surgical acceptation of the term, can only take place at the junctions between the ends of the bones, or—as these parts are technically termed—the "joints."

In order to discuss the subject satisfactorily, we will divide its consideration into four heads. These are as follows:—

I. The definition of a dislocation, with a short account of the forces which lead to its causation.

II. The signs of dislocation.

III. A few of the points which distinguish fractures from dislocations.

IV. The treatment adopted by surgeons in the reduction of dislocations.

I. *The Definition of a Dislocation, with a Short Account of the Forces which lead to its Causation.*—A dislocation may be defined as the displacement of one or other of the bony structures of a joint, and is usually produced in one of two great ways—external violence or muscular action.

External violence may act directly upon a joint by forcing the articular surfaces apart, as when the foot is displaced by a twist of the ankle or the thumb driven backwards by a blow. More commonly, however, the force which leads to the mishap is applied at a distance from the seat of injury, and the end of the bone is thrust out of its socket by the lever-like movement communicated to the shaft. We see this exemplified when the head of the humerus, or upper arm-bone, is driven from its natural resting-place by a fall on the hand, or the head of the thigh-bone, wrenched out of the socket at the hip by some untoward movement.

Muscular action sometimes gives rise to dislocation, and we occasionally find that the lower jaw is dislocated by opening the mouth too widely. Instances are also on record where violent muscular effort has given rise to a luxation of the shoulder-joint.

II. *The Signs of Dislocation.*—The first and most obvious sign following a displacement of joint surfaces is pain. As in fractures, so in dislocations, it is an almost constant symptom, and is rarely absent. The second sign is one which is also common to fractures, and consists of an inability to use the affected limb. If, for example, an arm be dislocated, it hangs helplessly by the side, and the individual is generally found in the position of supporting the injured limb by means of his other hand. The third sign is a change in the outline of the parts around the joint, and an alteration in the relation of certain osseous prominences. The head of the bone is felt to be out of its socket, and, at the same time, the socket in which it ought to repose is found to be empty. The fourth is an alteration in the length of the limb, and a change in the direction of its axis.

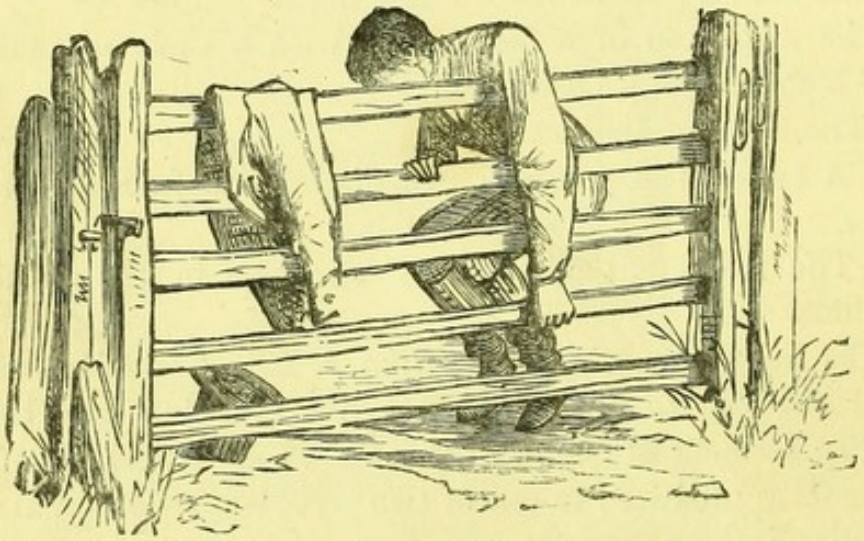


Fig. 33.—Attempt to reduce a Dislocation at the Shoulder.

III. *Some of the Points which Distinguish Dislocations from Fractures.*—A dislocated part is fixed and immovable, whereas in fracture there is a preternatural degree of mobility. In a fracture the fragments are, as a rule, easily replaced by extending the limb, but when the extension is removed the broken ends generally show a tendency to assume their old position. A dislocated part on the other hand is only reduced after some little difficulty, but when we succeed in replacing the head of the bone it usually remains there.

In fractures we seldom or never see lengthening of the affected limb; and if there is any change apparent it is one of shortening. This feature is well exemplified in a fracture of the thigh occurring about the middle third of the bone, where, owing to the strong muscular contraction which ensues, the fragments over-ride each

other, and there may be as much as two inches of shortening. Along with the shortening there is almost invariably an eversion of the foot. In a dislocation of the hip, if the head of the bone is carried upwards or backwards, we have shortening, but if downwards we have lengthening of the limb. An inversion of the foot and knee frequently accompanies displacement of the head of the femur, and is a point to be noted when the case first comes under observation as one contributing towards the diagnosis of the injury.

IV. *The Treatment of Dislocations.*—The treatment of dislocations may be summed up in a very few words. We require (1) to make certain—or form a diagnosis, as it is termed surgically—in regard to the particular kind of displacement with which we have to deal, and (2), having satisfied ourselves on this point, we must take the necessary steps for restoring the head of the bone to its normal situation. A dislocation should be reduced as soon after its occurrence as possible, as, when delay takes place in the adoption of remedial measures, we find that complications not infrequently ensue. The great obstacle with which we have to contend in the disposal of the class of injuries now under consideration is muscular contraction, but this difficulty can fortunately, in professional hands, be overcome by the administration of chloroform. If it should happen that we are compelled to operate without the aid of anæsthetics, it is often no easy matter to accomplish our object, the amount of muscular resistance which is offered being so great as almost to defy our best efforts. Under any circumstances the reduction of a dislocation is attended with some little trouble, and should not, unless in very extreme cases, be attempted by ambulance pupils without the approval of a medical man. This injunction is all the more binding because, in the majority of instances, a tractive force of greater or lesser degree requires to be brought into play before we can succeed in replacing the head of the bone. With dislocations of the shoulder-joint, for example, the heel is commonly inserted into the arm-pit, and extension practised by pulling on the hand of the patient until the head of the humerus slips into its socket.

In the case of a dislocation of the hip, the old method consisted in bringing into play a good deal of mechanical force by means of strong pulleys, the particular *modus operandi* being determined by the direction which we wish to impart to the head of the thigh in returning it to the socket. With these facts before us, it must be evident that if either of the lines of treatment which have just been

described should be pursued by persons with little or no anatomical knowledge to guide them, a fracture of the neck of the bone might soon be superadded—a serious complication for even an experienced surgeon to cope with. Errors in diagnosis have also led to the confounding of a fracture with a dislocation, and it is not difficult to see that under a mistaken idea of this kind a violent manipulation of the parts is certain to give rise to more or less laceration of the surrounding structures. Indeed, instances are not wanting where even large blood-vessels have been injured by rough and unskilled handling.

The figure shows a method of self-reduction of a dislocation of the head of the humerus, or upper armbone, into the armpit. The sufferer grasps a lower rail of the gate, and, in the absence of all other aid, attempts (by causing the top rail to press on the head of the bone) to force the bone into its natural socket in the shoulder-blade.

CHAPTER XI.

BANDAGING.

BANDAGES are used to keep dressings in positions, to give support to parts that are weak after accidents or otherwise, to keep muscles at rest, and in some instances to make compression over bleeding points or parts that are swollen. The application of a bandage to a swollen limb, may, however, require much caution, and, as a rule, is not to be made without medical advice and supervision.

There are three different kinds of bandages—the *Roller*, the *Triangular*, and the *Special*. These vary partly as to their form, partly to their mode of application, and partly also as to the material of which they are made. Roller and triangular bandages are made of unbleached cotton, linen, flannel, etc. In an emergency they may be readily made from strips of old sheeting. The special bandages are ususally made of some particular material, such as indiarubber, elastic webbing, or plain webbing, and have special applications.

The roller bandage is the one most commonly used by surgeons. Its skilful application requires some practice. It consists of one or other of the materials already mentioned. These are torn into strips of various lengths and widths, and *rolled* up before being

used. It is from this circumstance that the bandage receives its name. The lengths and widths vary according as the bandage is required for different parts. A glance at the table will explain.

	Width.	Length.
Finger bandages	$\frac{1}{2}$ to $\frac{3}{4}$ in.	1 yd.
Arm „	2 „ $2\frac{1}{2}$ „	3 to 6 yds.
Leg „	$2\frac{1}{2}$ „ 3 „	6 „ 10 „
Chest „	4 „ 6 „	8 „ 12 „
Head „	$1\frac{1}{2}$ „ $2\frac{1}{2}$ „	4 „ 6 „

These measurements are not to be taken as absolute, but approximate. Bandages are sometimes known by numbers, which express their widths, and tell how many have been made out of a piece of cloth measuring one yard, or 36 in. across. Thus No. 16 would signify a bandage $2\frac{1}{2}$ in. in width, sixteen such being made out of one yard; No. 12, a bandage 3 in. in width; No. 8, one $4\frac{1}{2}$ in. in width; and so on. The strips being torn, the next

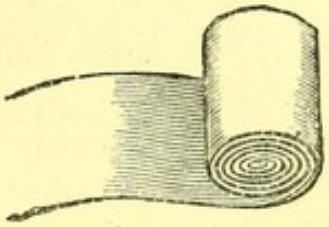


Fig. 34.—Single Roller.

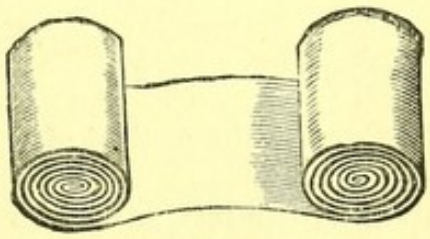


Fig. 35.—Double Roller.

thing is to have them rolled up. No bandage is likely to be put on neatly and with comfort unless it be first well rolled. In many hospitals it is the custom to do this by means of small machines, made for the purpose; but it can also be done very well by the hand. There will be a slight difference in the mode of procedure according as a single (Fig. 34) or double (Fig. 35) roller is required.

In the former case one end of the bandage is taken and folded over and over until a small roll is made. This may be facilitated by using a match, a knitting-wire, or similar article to start upon. The bandage is then taken with the roll between the hands, the unrolled portion uppermost, as in Fig. 36. The thumbs are placed on the top of the roll, and a friend or assistant asked to pull upon the strip and pay it out slowly, as required. By an alternate movement of the hands the roll is made to turn round and round on itself, and the bandage is thus gradually wound up. If properly held by the assistant it presents a compact appearance, and can be more easily applied than if it were in a soft, bulgy mass, as it too

often is. If the aid of a second person cannot be had, then the roll may be taken between the finger and thumb of the right hand, and

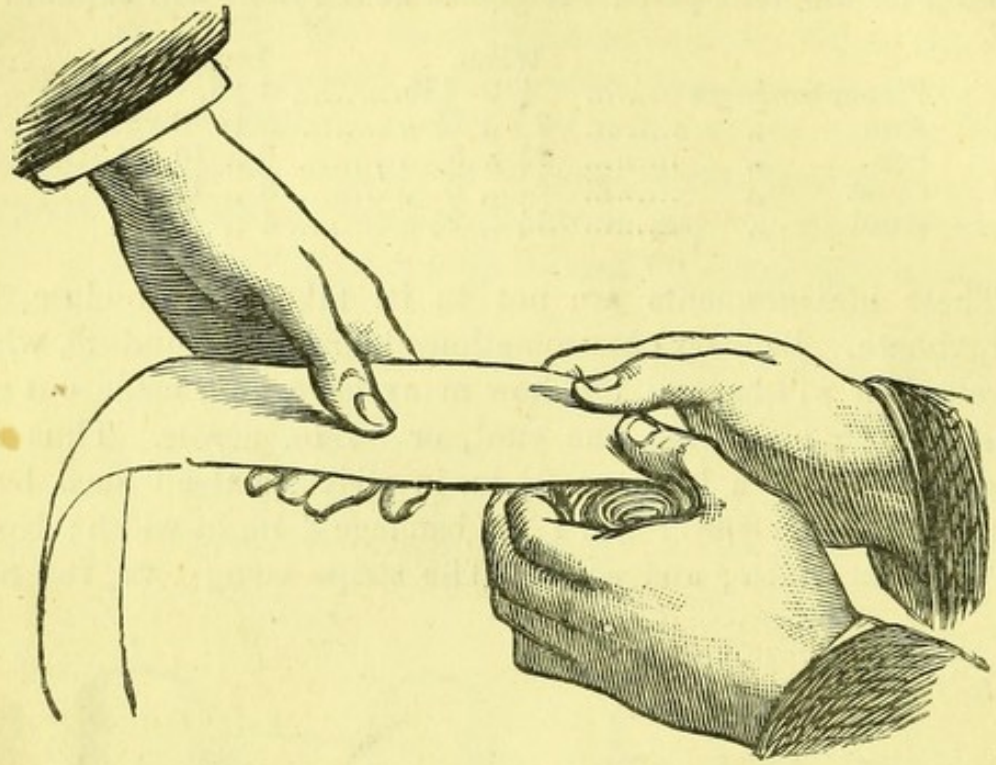


Fig. 36.—Showing the method of Rolling a Bandage between the Hands.

pulled upon by the left, as shown in Fig. 37. Still another method of doing it without aid is to lay the roll on a table with the unrolled

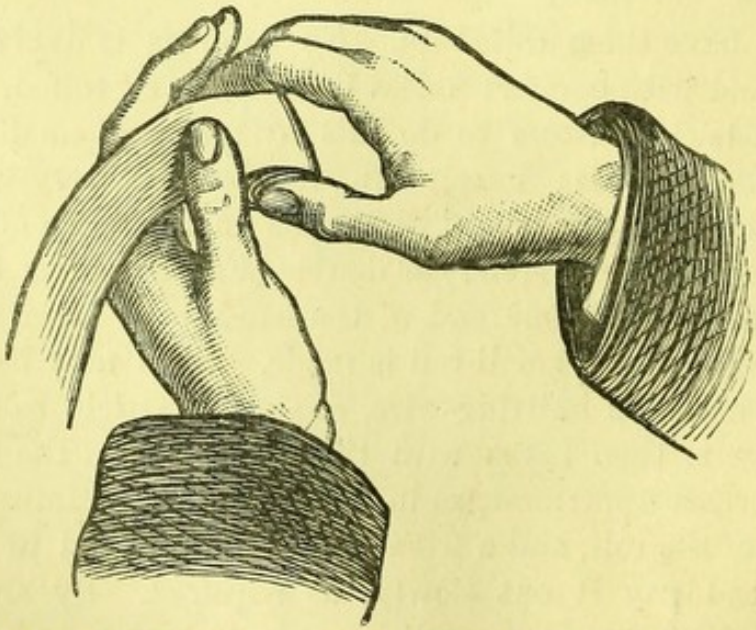


Fig. 37.—Method of Rolling a Bandage without aid from an Assistant.

portion underneath. It can then be stretched by the left hand while it is being rolled by the palm of the right. A double roller

(Fig. 35) is made in a very similar manner, with the exception that the centre or some other fixed point in the strip is first marked out. The bandage is then rolled from each end towards that point.

Having got our bandages ready for use, how are we to put them on? The conformation of the body renders their applications somewhat varied, though not so much so as might at first sight appear; but there are a few rules or principles which govern the application of every roller bandage. We shall consider these first.

The operator must place himself in a convenient position. Usually this will be in front of the patient, who, as he may find the process a tedious one, should be either sitting or lying down. The bandage must then be taken in either hand, a little of it unrolled, and the free end grasped by the fingers of the opposite hand. I say either hand, because a bandager should be ambidextrous, and it is quite an easy matter even for those who are not naturally ambidextrous to learn to bandage with either hand. The bandage is then to be applied with its outer side next the skin. The roller may thus be made to lie closer, and to look neater than if it were put on in the contrary way. A glance at Figs. 41, 46, 49, 50, which show the roller held in the hand, will explain what is meant. The whole width of the bandage must be made to lie close to the skin, and no part of the skin, except in special circumstances, should be left uncovered (Fig. 40). Where the whole width does not lie close, "pockets" are formed; the bandage is thus easily ruffled and loosed, and becomes very uncomfortable. In the case of a limb the bandaging must be begun from below—that is from the hand or foot, and carried upwards. It should also be begun from the inner side (Figs. 38 and 41). This is not absolutely essential, but it adds greatly to the neatness of the bandage to do so, and the "reverses," which will be explained further on, look better when made to lie to the outer side. It is for this reason that those who desire to excel, should learn to bandage with either hand.

Lastly, the bandage must not be either too tight or too loose, but must make equal and uniform pressure in all parts. Over-tightness in bandaging has more than once cost a patient his limb, and even his life. When finished it should be fixed by a pin put in parallel to the width, or by a stitch, and not by the slovenly method of tearing the end in two strips, which are carried round the limb on opposite sides and knotted.

With a few exceptions, roller bandages are applied either in the

form of a *Spiral* or of a *Figure of Eight.* The latter, which is also known as the Spica, from its fancied resemblance to the spike or spathe of flowers, is the bandage used for the different joints (Figs. 43, 44, 45). The parts of the limbs between the joints, the fore-arm and upper-arm, the leg and the thigh, are bandaged by means

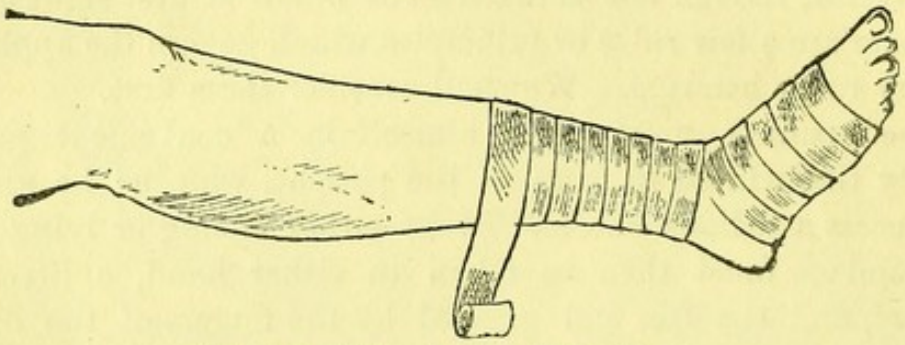


Fig. 38.—Simple Spiral Bandage.

of the Spiral, which may be applied either as a Simple (Fig. 38) or a Reverse bandage (Fig. 39), or if a double roller be used, as a Double Spiral. The latter bandage is seldom put on, and is really more curious than of practical use. We may, therefore, disregard it altogether.

The simple spiral is very easily applied, and would be the only kind of bandage required were our limbs in every part of the same

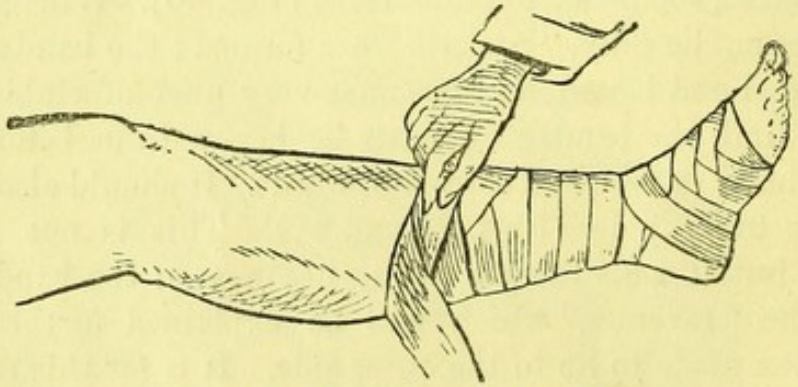


Fig. 39.—Reverse Spiral Bandage.

circumference. The increase in circumference, as we proceed upwards, renders the reverse spiral necessary. How is the simple spiral put on? Fig. 38 shows this pretty clearly. Suppose we take the limb in the illustration—the right leg. The bandage is represented as having been begun on the inside of the foot and wound round foot and leg above the ankle till the calf is reached. It would be seen that these turns or "spirals" lie closely against the skin; the upper half of each is covered by the one following it,

so that a uniform distance is preserved between the lower edges. There is no puckering, or, as it is sometimes called, "pocketing;" and no part of the skin, excepting the heel, remains uncovered; in fact, each part is twice covered, as the upper half of every turn is covered by the lower half of the turn immediately above. If, however, we try to go further up the limb with our "simple spirals," we find ourselves in a dilemma. If we follow the rule of applying the bandage closely to the skin in all its width, we get a result somewhat like that shown in Fig. 40.

If, on the other hand, we endeavour to cover in the whole of the calf, the turns are "pocketed" at their lower edges—they do not lie against the skin in their whole width—and, as a consequence, the bandage is the reverse of neat and comfortable. How are we to get out of our dilemma? Simple spirals are of no use, but the reverse spiral comes at once to our aid. A "reverse" is nothing

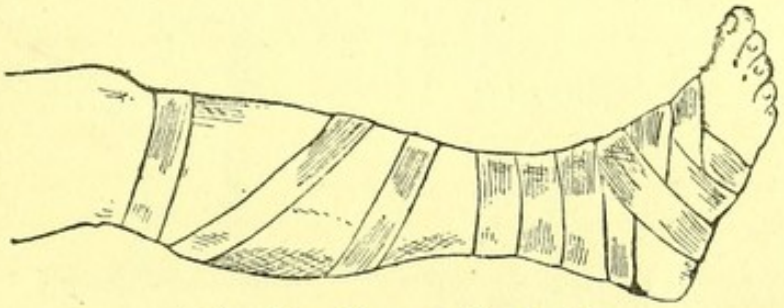


Fig. 40.—How not to do it.

more than a simple spiral *turned back* upon itself (Fig. 39). This turning back enables the bandage to accommodate itself to the limb. Its application prevents some slight difficulty to the beginner, which a little practice and attention to two simple rules will soon overcome. These rules are, first, that no reverse must be made upon a bony prominence, as, for example, the shin-bone; and, second, that, in making the reverse, the roller must be held somewhat loosely, or be allowed to give a little. A reverse cannot be well made so long as the roller is tightly held. The making of the reverse is assisted by putting the thumb or finger on the bandage (as shown in Fig. 39), though this is not essential, as it can be made without. The beginner will probably find it best, however, to do it as illustrated. When are reverses to be made? As soon as we find that simple spirals will no longer accommodate themselves, or lie closely to the limb.

Let us now consider what forms of the roller bandage are applicable to the various parts of the body. We may commence with

the *foot and leg*, as these are the parts usually first given to a beginner to practise upon. The operator must first place himself in front of the patient, whose heel, a part that is rarely covered by a bandage, should rest on a footstool (Fig. 41). If the right foot is the one to be treated, the roller should be taken in the left hand; if the left foot, in the right hand. It may be well to repeat that this is not essential. The right leg may be bandaged by the right hand, but the bandage will then have to be commenced from the outer side of the foot, which, to a certain extent, spoils the appearance of it when finished. The end of the bandage is unrolled a little way, its outer side placed next the skin on the inner side of the foot, and a figure of 8 is formed by carrying it round the front

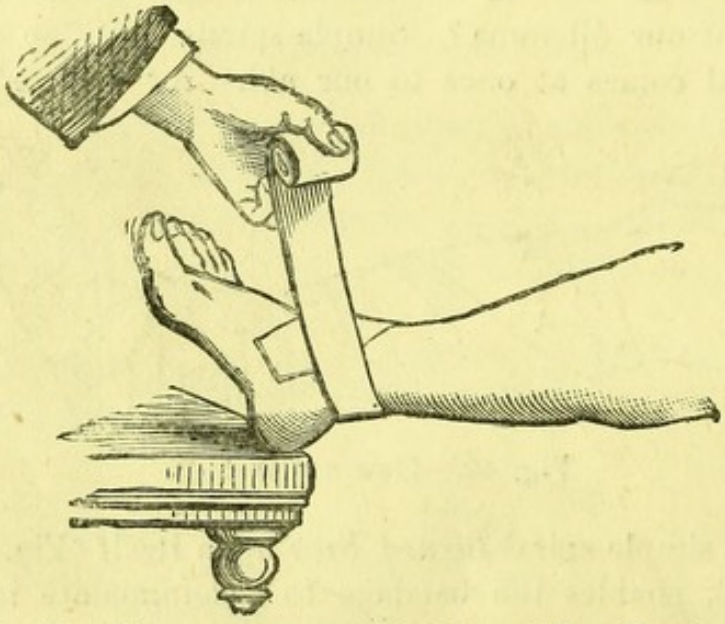


Fig. 41.—Commencement of Ankle and Leg Bandages.

of the ankle by the outer side to the tendon at the back of the heel, thence by the inner side to the front of the ankle again, where the first part of the bandage is crossed, from this point to the outer side of the foot beneath the sole to the inner side where the commencement of the turn is covered in. This is repeated two or three times, each turn after the second being carried further up the limb, to the extent of one-half or one-third of the width of the bandage.

When the ankle has been covered in in this way, a few simple spiral turns are taken till the calf is reached. It is then necessary to make reverse spirals to accommodate the bandage to the limb; but, after the thickest part is passed, simple spirals will be found sufficient. The bandage must then be fixed by a stitch or a pin. If a pin be preferred, it should, if possible, be a safety one. Some-

times it is necessary to commence the bandage nearer the toes than is shown in Fig. 41. In that case a simple spiral should be made across the top of the foot, commencing at the ball of the great toe (Fig. 42). This is to be followed by a few reverse spirals till the instep is pretty well covered, then the figure-of-8 turns may be begun round the ankle, and the bandage continued up the leg as described.

The *ankle-joint* is bandaged by means of the figure-of-8 turns.

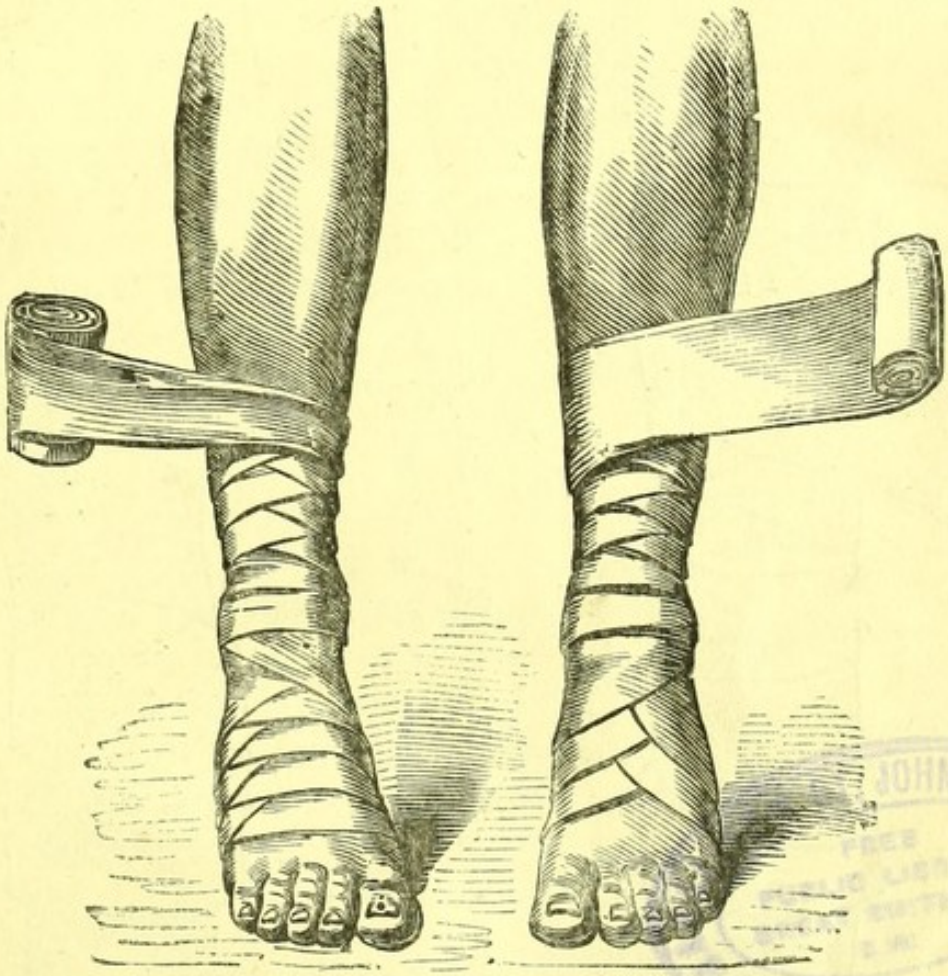
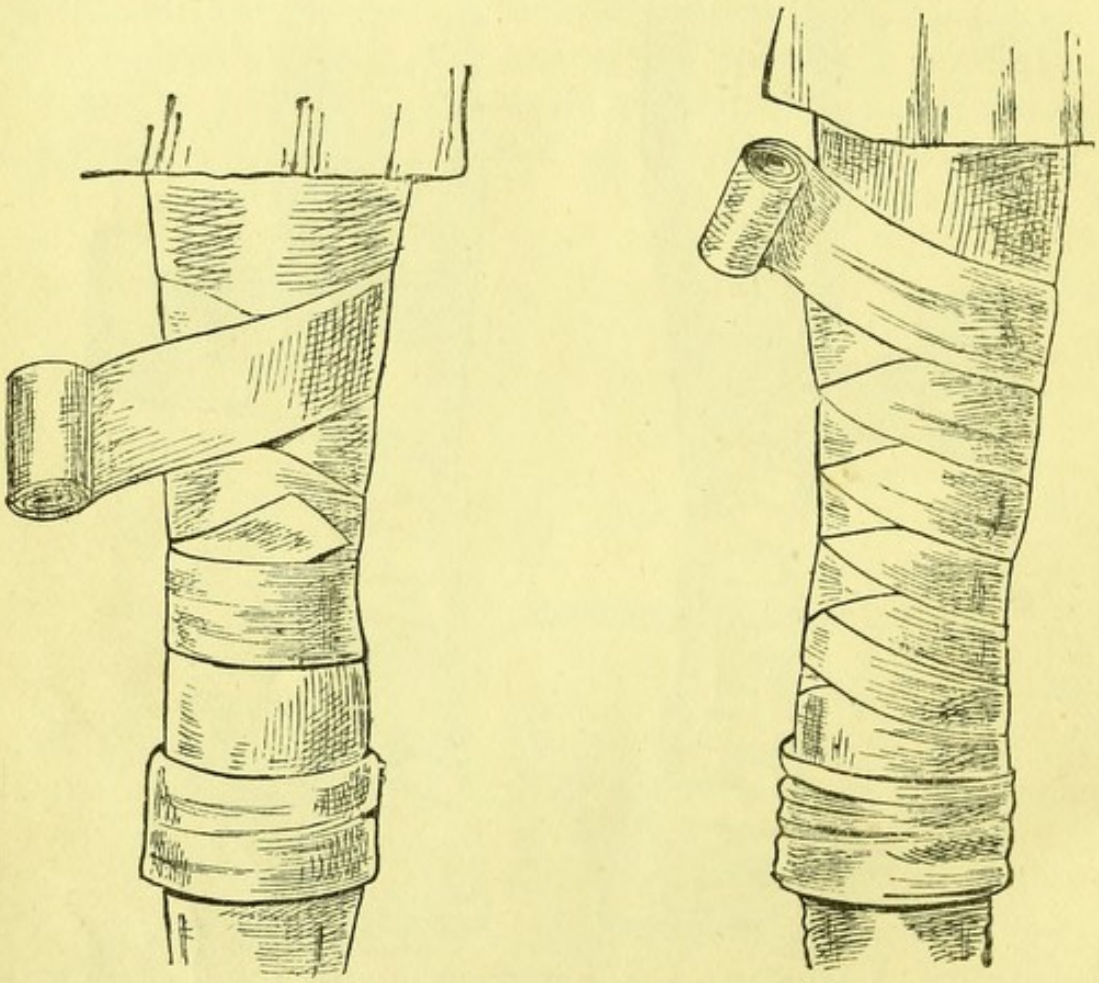


Fig. 42—Bandage of Foot and Leg (Heath).

Their application is shown in Figs. 41 and 42, and described in the preceding paragraph.

The *knee-joint* is also bandaged by means of figure-of-8 turns. Their application requires some care, as they are very liable to slip. A simple spiral is first made below the knee-cap. This is followed by a turn passing upwards and outwards across the knee-cap to the outer side of the limb, and round by the ham to across the knee-cap again, but now taking a direction downwards and outwards (Fig. 43). This is again brought round by the ham below the joint, and the figure-of-8 repeated several times, till a result some-

what like that shown in Fig. 44 is obtained. Another method of making figure-of-8 turns on the knee-joint is to make the first turn —a spiral—over the centre of the knee-cap. The next turn is carried above the knee-cap, covering in the upper part of the spiral already made in a somewhat crescentic form, round the back of the joint to the point from which it started. It is now made to take a similar crescent-like course below the knee-cap, and to cover in the lower part of the first spiral, so that only a small elliptical portion



Figs. 43 and 44.—Spica of Knee-joint (Heath).

of it is left exposed to view between these two turns, which are, of course, the upper and lower loops of a figure of 8, the meeting of the loops being at the back of the joint. These figures of 8 are continued, each alternate loop being above and below the knee-cap, respectively, and getting a little further away from it each time, from which circumstance the bandage is known as the divergent-spica of the knee (Fig. 45).

The *thigh* is bandaged by means of simple spirals and reverse spirals, which present no difficulty. When it requires a bandage,

the whole limb, from the foot upwards, should be taken in, the leg-bandage being continued over the knee in the form of an ordinary figure of 8.

The *Groin Bandage* is like other joint bandages, a large figure of 8 carried several times round the upper part of the thigh and

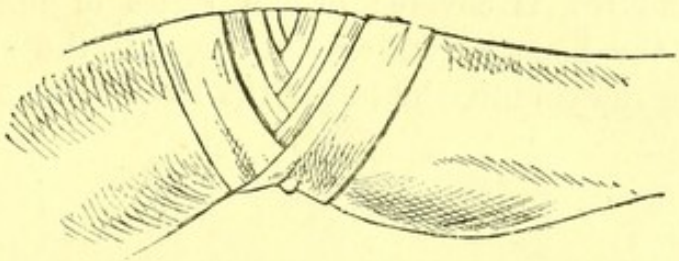


Fig. 45.—Divergent Spica of Knee-joint.

lower part of the abdomen. It is fixed first on the thigh by a simple spiral, then carried across the front of the abdomen to the opposite side, round the back and along the groin to the inner side of the thigh (Fig. 46). This is repeated two or three times, as often as may be necessary. Both groins may be bandaged at once by making first a few figure-of-8 turns on one groin, let us say the right, then carrying the roller across the front of the abdomen to the opposite thigh, round which it is brought and wound along the groin to the henchbone, from which it is brought round the back to the point from which it started. It is, however, easier for a beginner to bandage each groin separately.

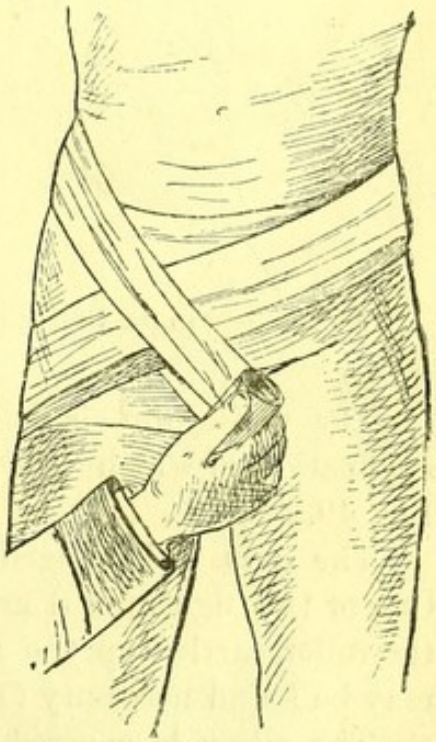


Fig. 46.—Spica of Right Groin.

The bandages for the upper limb are very similar to those for the lower.

The *fingers* are bandaged by simple spirals (Fig. 47). A turn is taken first round the wrist, then brought down the back of the hand to and along the finger which is to be bandaged down to its tip. It is then carried by simple spirals to the top of the finger over the back of the hand, where it crosses the former turn, and one or two turns round the wrist suffice to complete it.

The *thumb* may be bandaged in the same way, or by figures of 8, making a spica. The first turn is a simple spiral on the

wrist to fix the bandage. The roller is then carried over the back of the thumb, round in front and back again, so as to cross itself, thus making a small loop, which encloses the thumb. It is now brought round by the opposite side of the hand to the point from which it started. This is repeated till the whole of the thumb, except nail and tip, is covered in. A series of figures of 8 are thus formed, the loops of which are unequal, the smaller of the two embracing the thumb, the larger the hand (Fig. 48).

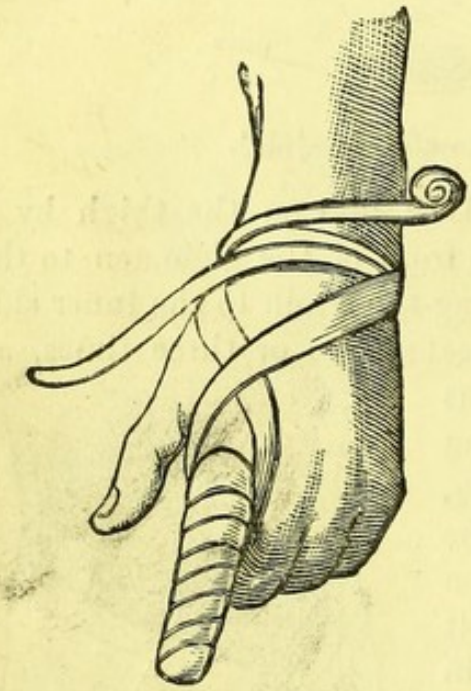


Fig. 47.—Finger Bandage.

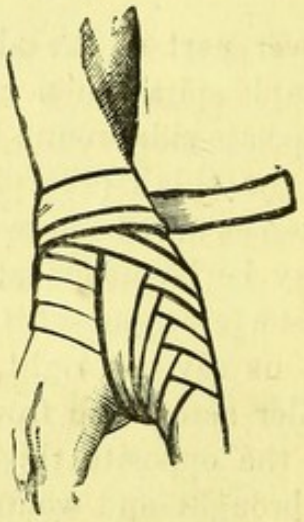


Fig. 48.—Spica of the Thumb.

The *wrist-joint* is bandaged by means of figures of 8, the application of which will be at once understood by a reference to Fig. 49.

The *arm* is bandaged in a manner very similar to the leg. One or two figures of 8 are first made on the wrist (Fig. 49), and the roller carried up the forearm by simple or reverse spirals, as may be found necessary (Fig. 50).

The *elbow* is covered in by means of figures of 8, which may be applied as on the knee, with the limb in a straight position, or the joint may be bent and the bandage applied as on the ankle—the loops of the 8 meeting in front, in the hollow of the joint. The peculiarity of this hollow with the biceps tendon standing out in the centre, makes it usually necessary to have a piece of cotton wadding on either side of the tendon to relieve undue pressure on any part, and to allow the bandage to accommodate itself more

easily to the joint. The elbow-tip is sometimes left uncovered like the heel.

The *upper arm* is done like the thigh, by spirals, which may be simple or reverse. When, however, the upper part of a limb has to be bandaged it will be found better to begin from the hand or foot and include the whole limb. By so doing the pressure will be equally applied, and there will be less risk of interference with the circulation.

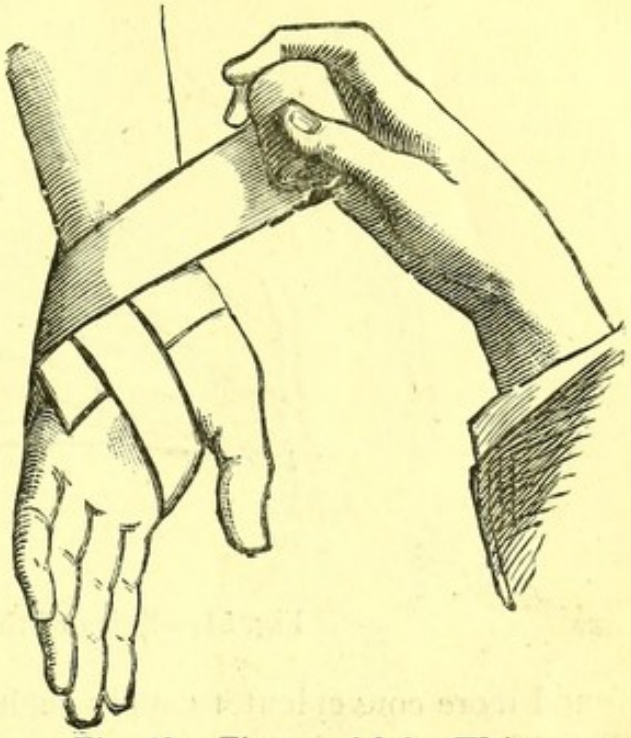


Fig. 49.—Figure-of-8 for Wrist.

It is sometimes necessary to fix dressings on the shoulder or the armpit. This may be done in both instances by modified figure-of-8 or spica bandages. In the case of the shoulder, a few spirals, simple or reverse, should first be made on the arm, as in Fig. 51. When the armpit is reached the roller should be carried across the front of the shoulder, round by the back, brought under the opposite armpit (the right in the figure), across the front of the chest to the shoulder again, where it is made to take a turn round the armpit, passing of course from back to front, and up to the point from which it is started. A figure of 8 is formed, the large loop being round the chest, the smaller round the armpit. This

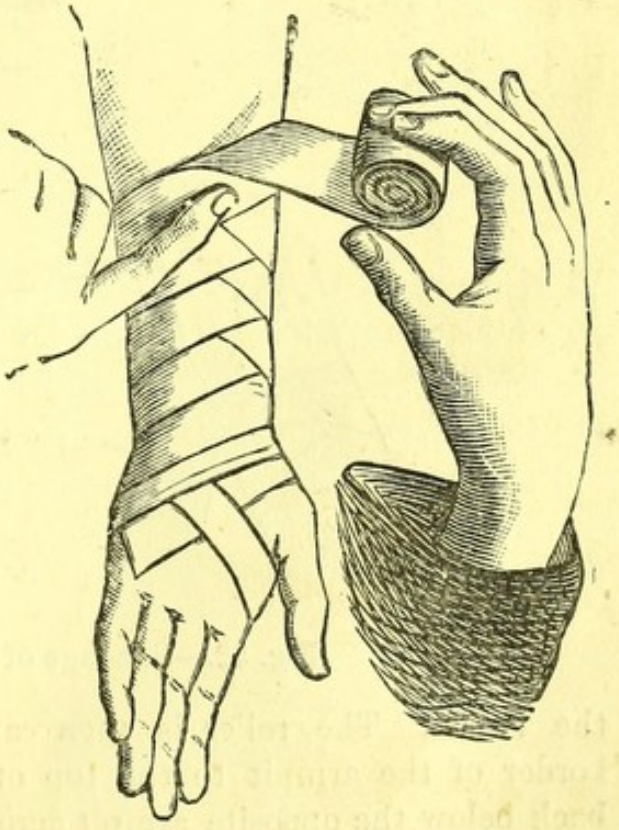


Fig. 50.—Bandage of Forearm.

manœuvre is repeated several times, giving a result like that in Fig. 51.

The same bandage will do for the armpit, but usually it is

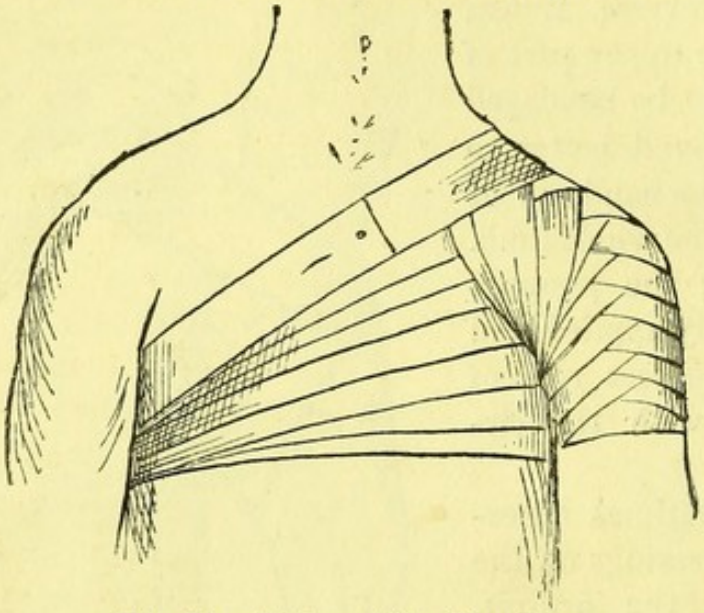


Fig. 51.—Spica of the Shoulder.

found more convenient to apply such a bandage as that shown in Fig. 52. A few spirals are first made on the arm, commencing from

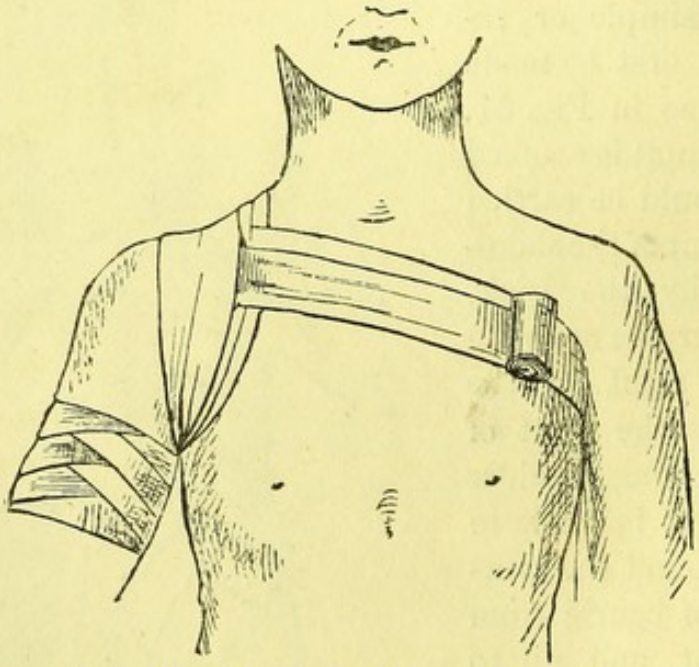


Fig. 52.—Bandage of Right Armpit.

the inside. The roller is then carried in front from the lower border of the armpit to the top of the shoulder, thence by the back below the opposite armpit across the front of the chest to the top of the shoulder, and so making the large loop of the figure of 8,

the smaller of which is then completed by bringing the roller across and behind the shoulder to the armpit, whence it started. This may be repeated as often as necessary.

When the chest requires to be bandaged, it should be done by means of a broad roller, which is simply carried round the chest two or three times with a moderate degree of firmness, and fixed by pins or tapes. These chest bandages are sometimes rendered uncomfortable by "rumpling." This may be obviated to a certain extent by attaching bands like braces to the upper parts of the bandage and bringing them across the shoulders.

The head may be bandaged in two or three different ways. Wounds in the region of the forehead, temple, or backhead may have dressings kept on by a few simple turns passing round the

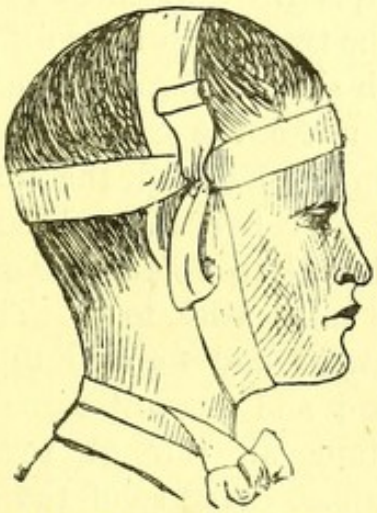


Fig. 53.—Knotted or Stellate Bandage.

Fig. 54.—Stellate Bandage.

head from back to front. Or the roller may, if so required, be made to pass over the top of the head and under the chin, a very common method, but not very elegant. Usually these two modes of bandaging are combined so as to lessen the tendency which the first, especially, has to slip. The bandage thus made is sometimes known as the Stellate, or Knotted bandage (Fig. 53). To apply it, the end of the roller is pulled out a little way so as to leave a tail after the bandage has been brought once round the head. This tail is then seized in one hand and held tight, while the roller is passed round it to take a second turn at right angles to the first turn. When this turn is completed, the third turn takes the same course as the first, the fourth as the second, and so on. It will be seen that if necessary a great deal of pressure may be exerted by this bandage, and it is in consequence found to be

specially useful in controlling bleeding from wounds in certain parts of the head, such as the temple.

A pad of lint must be first fixed on the wound, and this is compressed by the "knot," or that part of the bandage where the turns cross each other. When it is not put on to control bleeding, there is not the same necessity for knotting. It is sufficient to fasten with a pin (Fig. 54). When the top of the head has to be covered in, this will be best done by means of the bandage known as the capelline. To apply it a double roller is required, and the patient should be seated. The operator, standing at his back, commences by unrolling both ends of the double roller a little way (two or three inches). The outer surface of this unrolled portion is placed against the patient's forehead, and the ends unrolled simultaneously across either temple till they meet behind. This is the first step. The next is, as the two rollers have different functions to perform, to determine which shall perform the one and which the other. One of them must make the cap by passing backwards and forwards across the top of the head, the duty of the other being to fix these various turns before and behind. It does not matter which of the two is elected to do the one or the other, but having made our election we must stick to it. That is to say, the roller which fixes the backward and forward turns of the other must not itself make backward and forward turns over the top of the head. It must continue all through to wind round the head at the level of the temples. And so of the other roller, it must make its turns from back to front across the vertex till it is finished.

Suppose, then, that the operator has determined the roller, which is in the mean time in his left hand, shall make the cap (I say "in the mean time," because the rollers will have to be changed frequently from one hand to another before the bandage is finished). It will be observed that the rollers have met, but not crossed. This crossing is effected by passing the left-hand roller under the other. By a slight manœuvre, easily acquired, the rollers are made to change hands. The "cap" roller, as we may call it, is now carried right across the middle of the crown of the head from back to front, while the other is run round to the same point by the temple, and made to cross the "cap" roller on the forehead. The "cap" is then brought back across the "fixing" roller (Fig. 55) and the crown of the head, but slightly to one side, to the point from which it started at the back of the head, where it is again fixed. Its

third turn is from back to front, but slightly to the opposite side, in order that the crown of the head may be covered in symmetri-

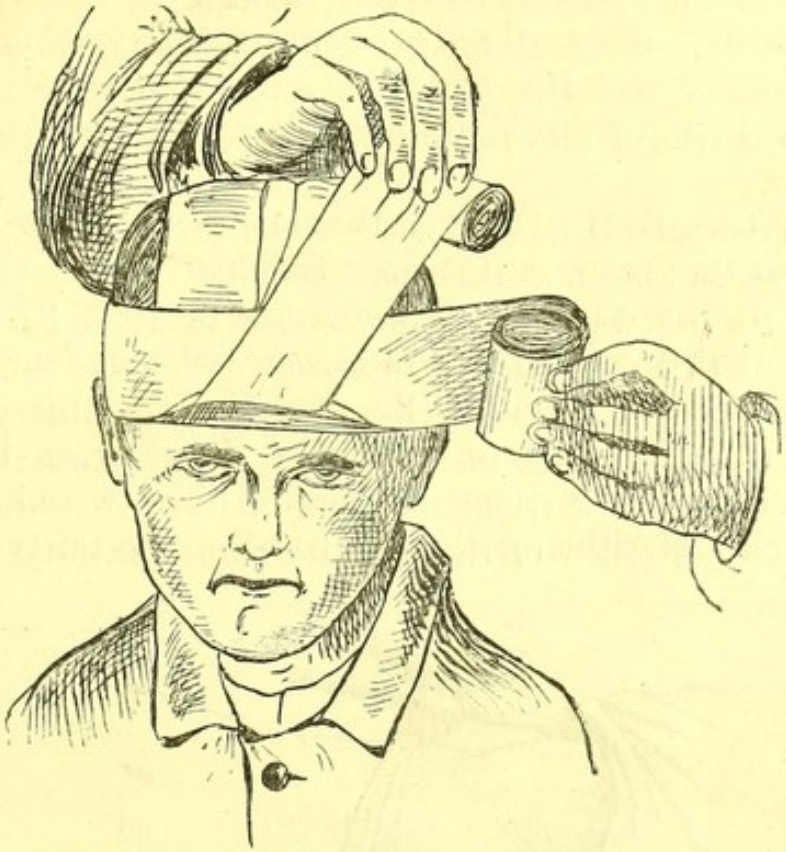


Fig. 55.—Mode of applying the Capelline Bandage.

cally. This is continued till the head is quite covered, the turns passing from back to front, covering in the one side, those passing from front to back the other side. Each turn of the "cap" roller must be fixed before and behind by the other roller, which simply passes round and round the head for that purpose. A little practice will soon enable any one to make a very neat "cap." Sometimes this bandage is modified to the extent of making a half-cap, to cover in one side of the head only. This is, however, a refinement of bandaging which we need not describe. When one has mastered the complete capelline, he will easily work out the half-capelline for himself.

Fig. 56.—Capelline Finished.

These are the principal modes of application of the roller bandage. There are a few others, but not of sufficient importance

to be described here. It may be well to remind the reader that an ounce of practice is worth a ton of theory, and that if he wishes to succeed in the application of this bandage he must practise it very frequently. Surgical nurses often bandage much more neatly than do many doctors, the reason being that they have more practice. This is true of all kinds of bandages, but more particularly of the roller.

The "Triangular Bandage" is the ambulance bandage *par excellence*. It is also known as the "handkerchief" or the "Esmarch" bandage. Its use was first recommended in 1832 by Mayor, of Lausanne; but its many advantages were not comprehended till it was re-introduced by Esmarch, the great German military surgeon, and its merits pointed out in his "First Dressing on the Battle-field." It consists of a triangular piece of linen or calico made by taking a piece of either of these, thirty-three to thirty-six inches

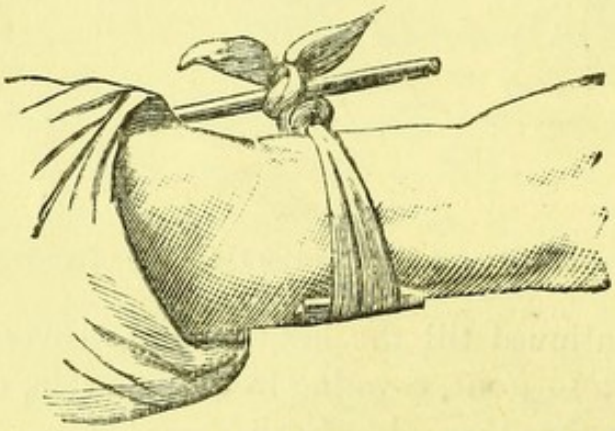


Fig. 57.—Triangular Bandage as an improvised tourniquet.

square or thereby, and cutting it across from corner to corner. Two bandages, each having the form of a triangle, are thus obtained. The cut border is known as the lower border or base, the corner opposite to it being the apex. It will, however, be seen that such a bandage may be readily improvised by simply folding, without cutting, a large pocket-handkerchief from corner to corner. Every one who is possessed of a handkerchief of sufficient size may therefore be said to have a triangular bandage ready for use. This piece of cloth, whether specially prepared or improvised, may be used for three different purposes—(*a*) as a tourniquet to stop bleeding, (*b*) as a sling for the arm, and (*c*) as a bandage to retain dressings.

The method of using the triangular bandage as a tourniquet is shown in Fig. 57. The bandage is folded up from the point or

apex towards the lower border like a cravat. It is then passed round the arm once or twice and tied with a reef-knot. A smooth stick or bar of some kind is passed between the bandage and the skin. This is twisted round two or three times until the bandage is sufficiently tightened to stop the blood-flow. If the position of the main artery is known, the pressure on it may be increased by

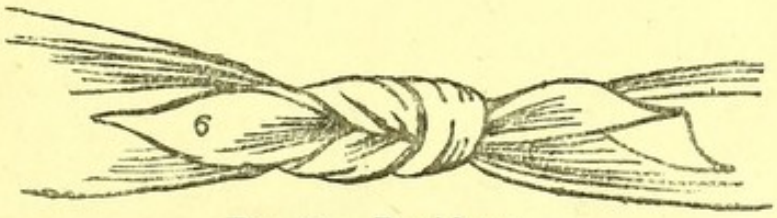


Fig. 58.—Reef-knot.

means of a pad placed along its course, as shown in the illustration; but if this is not known, it is better to leave the pad out. It is well to note that the bandage should in this instance be fixed by means of a reef-knot (Fig. 58). The "granny" knot (Fig. 59) should always be avoided; but in some instances where the band-

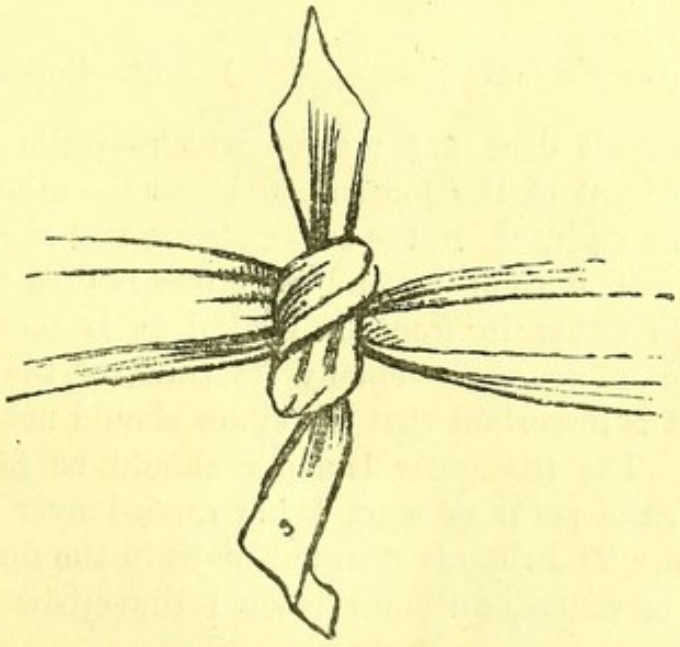


Fig. 59.—Granny-knot.

age is not used as a tourniquet, or great pressure is not required, it may be fixed by pins. The "granny" knot is very apt to slip; the reef is not.

There are two ways of applying the triangular or handkerchief bandage as a sling. It may be necessary that the whole of the elbow and forearm should be supported. This is more particularly required in certain cases of injury about the shoulder and some

fractures of the bones of the forearm. The bandage is fully opened out and placed between the fore-arm and the body, so that its apex points beyond the elbow. The upper end is then drawn over

Fig. 60.—Large Sling.

Fig. 61.—Small Sling.

either shoulder—it does not matter which—while the lower is brought up in front of the forearm and over the other shoulder to the back of the neck, where the two ends are tied in a reef-knot or fixed by pins. The point beyond the elbow is then tucked in and fixed by a pin either in front or behind as is most convenient (Fig. 60). In many cases—chiefly fractures of the bone of the upper arm—it is important that the elbow should not be supported by the sling. The triangular bandage should be folded at least once on itself, the point or apex being carried over to the lower border or base. The sling is then put on as in the former instance, there being, of course, no point beyond the elbow to attend to (Fig. 61).

The ways of applying the handkerchief as a bandage are many, and vary according to the part of the body where it is used, and according as it is required to retain splints or dressings in position. To fix splints after they have been fitted to a fractured limb, two or three bandages are necessary. They are folded up and passed twice round the limb and splints, the ends being tied in a reef-knot (Fig. 62), care being taken to put on the bandages so that one is above and another below the place where the bone is broken.

The vertex or the top of the head may be covered in as in Fig. 63. The bandage is opened out and laid on the head with the apex or point lying over the neck, and the long border across the fore-

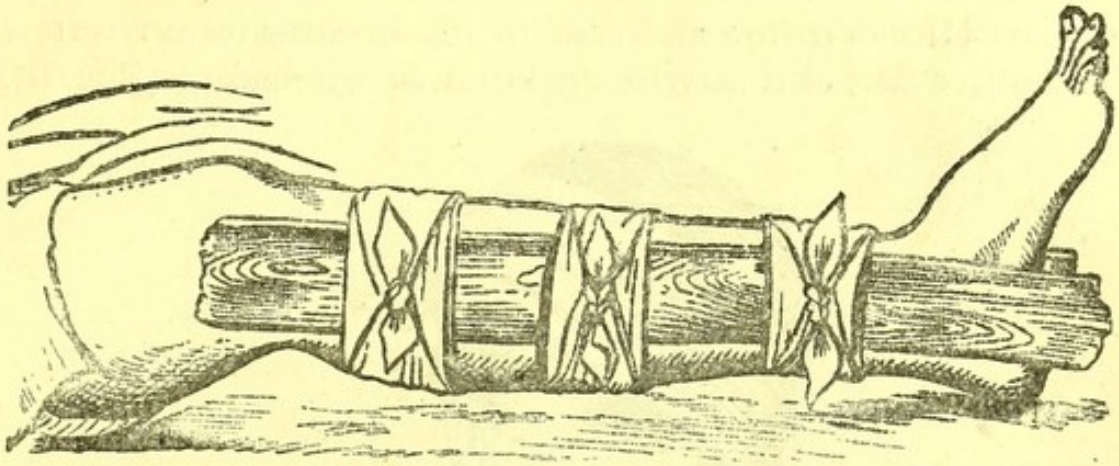


Fig. 62.—Triangular Bandages applied to retain splints in position.

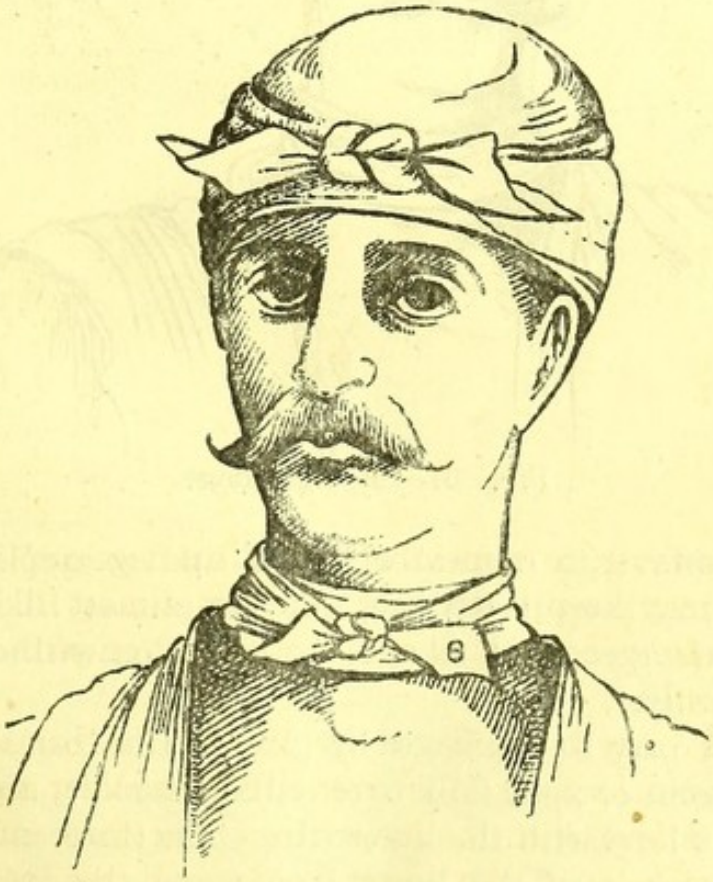


Fig. 63.—Triangular Bandage applied to Head.

head. The two ends of this long border are picked up, and, if not long enough, tied in a reef-knot outside that part of the bandage which is hanging over the neck. If they are long enough, they are

simply crossed and carried round to the forehead, where they are tied. The point is then turned up at the back and fixed with a pin. This forms a very efficient substitute for the capelline bandage, and is much more easily applied. The handkerchief may also be folded up narrow and used to fix dressings on any part of the scalp or face, or it may be applied as an eye-bandage (Fig. 64).

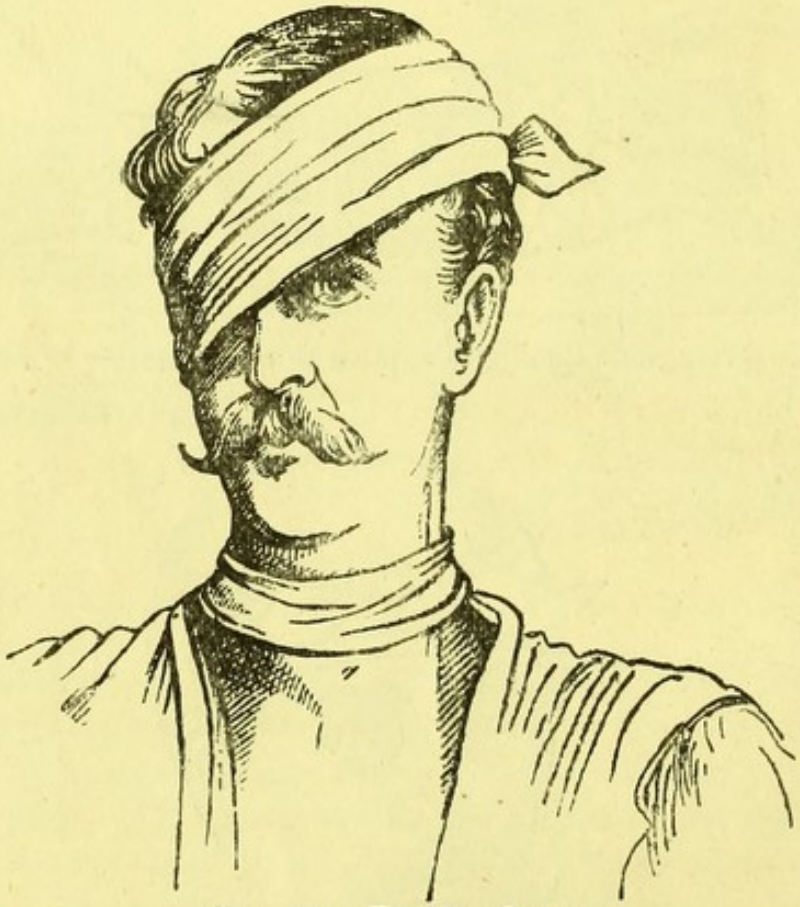


Fig. 64.—Eye Bandage.

It is well, however, to remember that a bandage applied so closely to the eye may keep it too hot, and act almost like a poultice. Except in emergencies it should not be put on without a doctor's sanction or order.

The chest may be bandaged by placing the bandage unfolded so that the point or apex falls over either shoulder, and the lower border is on a level with the lower ribs. The three ends (that is to say, the two ends of the lower border and the point), are tied together, two of them being first knotted, and the third fixed to the free part of either which projects beyond the knot (Figs. 65, 66). This bandage will not do for a case of fractured ribs. The chest bandage may be used to keep in position the dressings on a wound on the upper part of the shoulder, and the handkerchief may be

applied as it would be to any other part of the limb. It is folded till it is of a convenient width, the centre of it laid on the point where the dressings are required, the ends carried round the limb,

Fig. 65.—Bandage for Chest. (The figure also shows the triangular bandage applied to the elbow.)

Fig. 66.—Bandage for Chest. The ends tied behind in reef-knots.

crossed, and brought back to the centre of the bandage, and knotted. This will be found the most convenient mode of applying the bandage to the arm or leg (Fig. 67), with the exception of the hand, ankle, and foot.

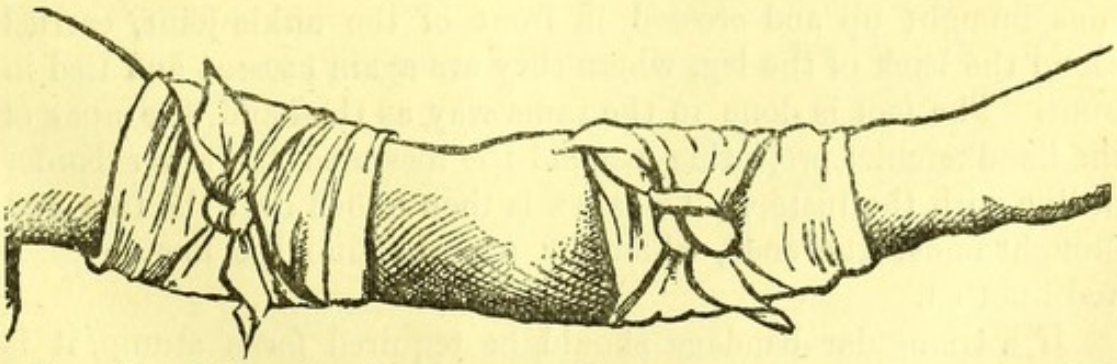


Fig. 67.—Triangular Bandage applied to Arm. (The same method is adopted in the lower limb.)

The method of bandaging the palm is shown in Fig. 68. The handkerchief is folded, the centre laid on the palm, the ends crossed

on the back of the hand, and again on the front of the wrist, and knotted on the back of that joint.

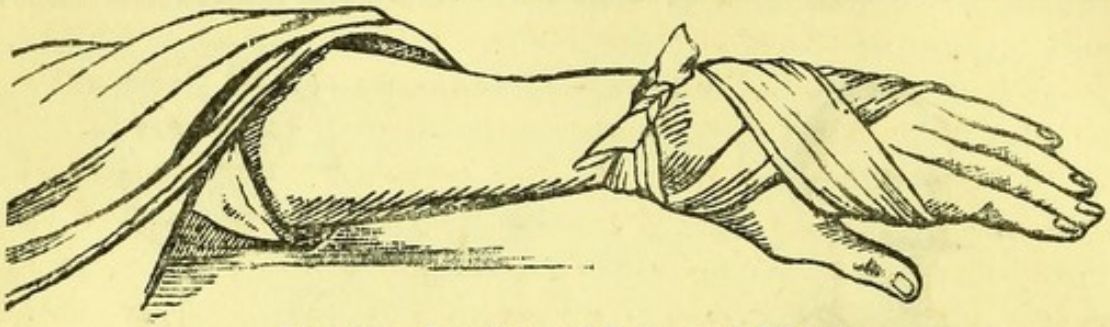


Fig. 68.—Bandage of Palm and Wrist.

Sometimes the hand must be entirely covered in by the bandage. For this purpose it is spread out so that the apex will lie beyond the fingers and the lower border in line with the wrist. The apex is then brought over the fingers to the lower border of the bandage. The two ends of this border are carried round the wrist above the apex, fixing it, and, after crossing, tied in a reef-knot (Fig. 69).

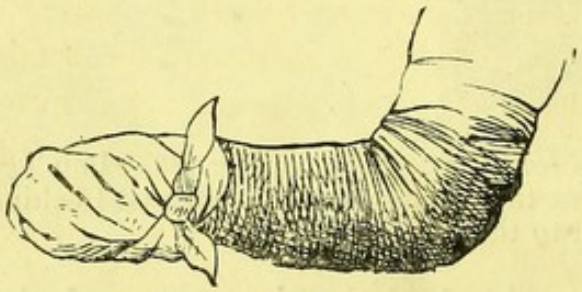


Fig. 69.—Hand Bandage.

The ankle may be bandaged in the same way as the palm and wrist, the centre of the bandage being placed under the sole, the ends brought up and crossed in front of the ankle-joint, carried round the back of the leg, where they are again crossed and tied in front. The foot is done in the same way as the hand, the apex of the handkerchief projecting beyond the toes, and the lower border in line with the instep. The apex is then folded over the toes and brought under the ends, which are passed round the foot, crossed, and knotted.

If a triangular bandage should be required for a stump, it is applied as on the hand and foot.

It is sometimes necessary to fix a dressing on the hip. Two bandages are used for this purpose. One is folded narrow and applied as a waist-belt. The second bandage is laid on with its

apex upwards, so that it can be slipped under the waist-belt. The ends of the base or lower border are passed round the thigh, crossed, and knotted on the outer side of the limb. The apex is then slipped under the waist-belt, drawn over it, and pinned down (Fig. 70).

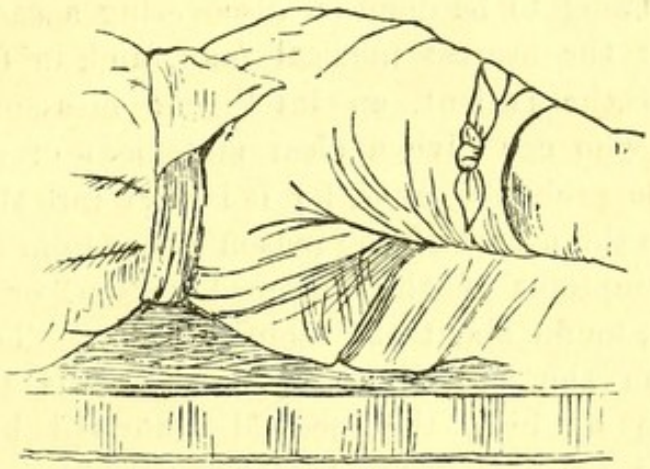


Fig. 70.—Triangular Bandage of Hip.

The value of the triangular bandage cannot be too strongly insisted upon. For ambulance work it is decidedly preferable to the roller. Those who wish to practise it for themselves will find the pictorial bandage sold by the Glasgow St. Andrew's Ambulance Association (West Regent Street, Glasgow) of very great help.

The special bandages to which allusion has been made cannot be considered in a work of this kind. Those who are interested in them are referred to the special surgical works in which they are described.

CHAPTER XII.

POISONS AND THEIR REMEDIES.

In writing this series of articles I intend bearing in mind that they are for the guidance of the non-scientific portion of the community, and shall therefore avoid, as much as possible, the use of technical and medical terms.

A case of poisoning may happen at any moment in any household, and in the confusion usually attending such an occurrence much valuable time is lost. In all cases of illness loss of time in commencing treatment may mean loss of life to the patient, but in poisoning every lost moment renders the treatment more difficult, and the prospect of recovery more remote. At such a time every

one wants to do something, but no one knows exactly what to do. It is this deficiency that I aim at supplying to the best of my power, and I trust I may be able to give to my readers a few plain directions how best to fill up that anxious time of waiting between the sending for and arrival of "the doctor."

The first thing to be done on discovering a case of poisoning is to send for the nearest medical man, and, in fairness to him as well as to the patient, an intelligent messenger should be selected, one who can give a clear statement of what is wrong, along with the probable cause, for it is very rare that no clue can be found as to the nature of the poison either from the occupation, habits, or symptoms of the poisoned person, or from bottles, packages, etc., found about the room or house. The reason I lay such stress on the "intelligent messenger" is that, from the account given by him, the medical man will know what instruments and antidotes, etc., to take with him, thus avoiding the delay that would ensue on having to send for these materials after his arrival at the case.

Having despatched the messenger, we must proceed to adopt the best means in our power to relieve the patient, and, as will be readily understood, these means will vary according to the nature of the poison taken. The best method I can adopt to point out the treatment in individual cases is to give an alphabetical list of poisons, irrespective of scientific classification, with the symptoms and treatment of each under its respective heading, and at the conclusion of this list, to sum up the general points that should be noticed as a guide to diagnosis and treatment.

We should be careful that all vomited matters, along with anything passed by the patient, be carefully kept until examined by the medical attendant.

Acids.—The majority of the poisonous acids act as *corrosives*, or in popular language "they burn" the tissues they come in contact with. The commonest acid of this description is sulphuric acid, or, as it is usually termed, "oil of vitriol," or simply "vitriol." It is easily procured, and this without exciting suspicion, thus making it a favourite poison for the suicide; and as it is largely used for manufacturing and domestic purposes, it may be taken or administered by mistake from an unlabelled bottle. It is usually met with as an oily liquid of brownish colour; it may, however, if very pure, be colourless.

Symptoms.—The corrosive or burning action of the acid will be

seen in the whitened patches or streaks on the tongue and mouth, and the blackened spots on any portion of the skin where the acid has touched. The shock to the system usually brings on collapse. The vomited matters contain blackened shreds. Severe pain in abdomen.

Treatment.—Do not give emetics or vomits of any description. Give baking-soda dissolved in water. If this is not at hand, common washing-soda dissolved in a large quantity of water will do. If you can procure a mixture of equal parts of lime-water and olive-oil, you can give it alternately with the soda solution. Milk or milk-gruel can be given to allay the great thirst.

Nitric Acid.—This acid is known as "aqua fortis" or "red nitre spirit," a liquid of various shades of colour, from red to light yellow. It is perhaps used for minor manufacturing purposes more frequently than the preceding acid.

The *symptoms* of poisoning by this acid are similiar to those produced by sulphuric acid, except that the stains on the skin are yellow.

Treatment.—As under sulphuric acid, to which we may add common whiting mixed up with water. This is of little use as an antidote to sulphuric acid poisoning, but it is as good as any other for nitric acid and has the advantage of being usually at hand.

Hydrochloric Acid.—This is known as "spirit of salt" and "muriatic acid." It is often used for domestic purposes, such as polishing brass, etc., and is an important material for the tinsmith. It is a colourness liquid if pure, and yellow if impure.

Symptoms.—In its action it is very similar to the preceding acids. The skin stains are usually white.

Treatment.—The same as under the two preceding poisons.

Oxalic Acid.—This substance is met with in the form of colourless crystals, which in novels are supposed to resemble Epsom salts; but the resemblance only exists in the author's imagination. The acid is also known by the following names:—"Acid of sugar" and "bonnet acid." It derives the first name from the fact that it can be made from sugar, the latter because it is used for cleaning straw bonnets. There are also some preparations in common domestic use which owe their poisonous character to oxalic acid, such as salt of sorrel, liquid blue, for laundry use; and I have known it sold as "salt of lemons" and ink eradicator. It is used by grooms and bookbinders for cleaning leather articles, and enters into the composition of many polishing-pastes.

Symptoms.—They vary greatly. There is usually pain and vomiting, the vomited matters having the appearance of coffee-grounds. The patient often sinks into a stupor, and collapse comes on.

Treatment.—The only antidote that can be administered is chalk or lime in some form. Whiting or whitewash scraped from wall or ceiling may be administered. As soon as it can be procured, some castor oil may be given. Do not give soda or potash preparations on any account.

Carbolic Acid (known as oil of tar).—It is met with either as a brown or colourless liquid, or in crystals, the appearance depending on its purity. It is the active ingredient in various toothache nostrums, and the acid itself is a common and much-used disinfectant. It has a peculiar, well-known odour, which can be readily distinguished by any one who has ever smelt it.

Symptoms.—Whitened patches in the mouth and skin. Strong smell of the acid in the breath. The patient speedily becomes unconscious.

Treatment.—Give oil—either olive or castor oil will do. Procure some Epsom salts, and dissolve half an-ounce in a tumbler full of warm water; administer portions at intervals. Apply warmth to the feet, and, if the patient shows signs of collapse or insensibility, warm water and brandy may be cautiously administered. The white of egg beaten up with warm water is considered an antidote; but the mixture must be given in large quantities to be of any use.

The foregoing poisons may be classed together as corrosive acids.

Prussic Acid (also known as hydrocyanic acid).—The poisonous properties of oil of bitter almonds are due to this agent. I would here remind my readers that it is possible to procure "oil of bitter almonds" which has been purified and rendered harmless, and in buying this flavouring liquid for domestic use you should insist on being supplied with the purified oil.

Cyanide of Potassium, used by photographers and electro-platers, acts in a similiar way to prussic acid, but is not so violent a poison. The treatment is similar to that for poisoning by the acid.

Treatment.—The action of this acid is so rapid that little can be done in the way of unskilled treatment. Dashing cold water over the back and chest, applying smelling-salts and hartshorn to the nose are the most effective methods of treatment that can be

adopted. Artificial respiration (a subject which has been treated under another heading of this series) should be carried out until the arrival of the medical man. If the patient can swallow, brandy may be given.

ALKALIES.—By the term alkali I mean those substances which have properties opposite to acids. The substances I have indicated as suitable antidotes for acid poisoning were alkalies, and, in the same way, the acids become antidotes for poisoning by alkali. The commonest acid in domestic use is vinegar, and it is also a safe and ready antidote for the class of poisons now to be described. The commonest alkalies are potash, used as caustic potash, or pearl ashes; soda, known as carbonate of soda (not bicarbonate), washing soda, and caustic soda. The latter has come into vogue lately as a rat-poison.

Ammonia, hartshorn, etc., can be classed with alkaline poisons, producing the same symptoms and requiring the same treatment.

The various washing-powders contain one or other of these substances amongst other ingredients.

Symptoms.—Burning pain in throat and stomach, purging, and cold clammy skin. If the substance was swallowed in a concentrated state the mouth and lips may be corroded.

Treatment.—Give vinegar freely diluted, alternated with olive or salad oil.

Soap lees are sometimes accidentally swallowed; the symptoms and treatment are the same as for alkalies.

ACONITE.—This plant is commonly known as Monkshood or Blue Rocket. The root has been taken in mistake for horseradish. It is used in medicine as an external application for allaying pain, and, therefore, may be a constituent part of liniments, etc. It is also an ingredient in many quack medicines, especially those used for neuralgia. It may not be out of place here to point out the differences between aconite and horseradish.

In aconite the root is somewhat slim, and rapidly tapers to a point, giving off from the sides numerous small roots. When scraped the white internal surface turns red. It has at first a bitter taste, and then causes a most persistent tingling sensation followed by numbness.

Horseradish-root is more cylindrical, longer, and does not taper. It gives off a pungent smell when scraped, and does not turn red on exposure to air. The taste is hot and pungent, but it produces neither tingling nor numbness.

Symptoms.—The tingling and numbness referred to above are well-marked symptoms of aconite poisoning. These symptoms become more marked, and the numbness extends to the extremities. Loss of power over the limb follows.

Treatment.—Give an emetic at once. A tablespoonful of mustard in a cupful of warm water is a safe emetic. Send to a druggist for an emetic (this will usually consist of twenty grains of sulphate of zinc), and administer it if the mustard does not act. If emetics fail, tickle the back of the throat with a feather. If the patient is prostrated, give stimulants freely. Keep the feet warm with hot bottles. Do not let the patient rise up in bed—the recumbent position must be insisted upon until urgent symptoms disappear.

ALCOHOL.—Alcohol, although not properly looked upon as a poison, yet must be classed as such, as, when taken in excessive quantity, it produces dangerous symptoms, often ending in death.

Symptoms.—The symptoms of alcoholic poisoning might be considered as too well known to need description, but yet there is often some difficulty in distinguishing between it and apoplexy, as a reference to our police reports unfortunately show.

Treatment.—Give an emetic at once. If the patient is insensible, pour cold water on the head. Administer hot coffee after the emetic has acted.

ANTIMONY.—Antimony is met with in various forms. Antimony wine and certain quack medicines for hooping-cough contain tartar-emetic, which is a preparation of antimony. Butter of antimony is sometimes a constituent of furniture-polish.

Symptoms.—Vomiting and purging, severe pain, cramps in the limbs, metallic taste in the mouth. If the butter of antimony has been taken, these symptoms will be accompanied with corrosion of lips and mouth.

Treatment.—Strong green tea; white of egg beaten up with milk and water. Large draughts of tepid water will help the removal of the poison by promoting vomiting.

If the "butter of antimony" has been taken, combine the above treatment with the administration of magnesia stirred up with milk.

ARSENIC.—Arsenic is usually met with as arsenious acid, a white powder, which, according to law, should only be sold when mixed with soot or indigo to colour it. This regulation is, however, more honoured in the breach than in the observance. Arsenic

is also a constituent of a number of vermin-killers and rat-poisons. Fly-papers usually consist of paper soaked in a solution of arsenic.

Symptoms.—Griping pain, vomiting and purging, great thirst, and metallic taste.

Treatment.—Give an emetic at once; send for oil and lime-water, equal parts; give it frequently.

Sometimes when the arsenic has been taken for some time and in small quantities, as in the case of persons living in a room papered with arsenical paper, or from wearing clothing coloured with arsenical colours, etc., the symptoms are not so well defined as those described above. The case then, however, would come under the notice of a medical man, and it would be useless and out of place to say any more about it here.

Belladonna, known better by the name of "deadly night-shade," is a plant which grows in this country in many a lane side. It bears a berry a little smaller than a cherry, and of a black colour when ripe. These berries are often eaten by children.

Symptoms.—Evidence of great excitement, flushed face, the pupil of the eye is dilated, or, in common parlance, the eye becomes large. This, of course, affects the vision, which becomes indistinct, objects appearing blurred and sometimes double. Constant motion of limbs and staggering when attempting to walk.

Treatment.—An emetic at once—mustard and water, until a more efficient one can be procured from the druggist. Put hot-water bottles to the feet and strong mustard poultices to the calves. Hot coffee may be given, and if there is much collapse stimulants may be administered cautiously.

Bryony.—A wild plant growing in hedges and bearing red berries often eaten by children.

Symptoms.—Very similar to belladonna.

Treatment.—Emetics.

Camphor.—This substance is not generally looked upon as a poison, and solutions of various strength are common domestic medicines for slight ailments. Caution should, however, be used in their administration, as an extra dose may bring on alarming and dangerous symptoms.

Symptoms.—Giddiness, convulsions, smell of camphor in the breath.

Treatment.—Emetics and stimulants. Pour cold water on the head and chest, keeping the feet warm with hot-water bottles.

CHLORAL HYDRATE.—This substance is well known as a producer of sleep. From the number of deaths that have happened through its use, it seems to be more easily procured than it should be. The public cannot be too strongly warned against its use without the advice of a medical man. It is a drug which accumulates in the system, and thus may ultimately cause death very rapidly. A number of patent medicines contain chloral.

Symptoms.—Very deep sleep, from which the patient can only be roused with difficulty. Face and neck often flushed; body cold.

Treatment.—Rouse the patient by slapping the face and chest with a wet towel; administer an emetic of mustard and water; apply mustard poultices to the calves of the legs; keep the body warm by hot bottles, etc., and above all do not allow sleep to get the mastery. Hot, strong coffee is a useful stimulant in such a case. In chloral poisoning it is not advisible, without orders from a medical man, to keep the patient walking about to ward off sleep.

COAL-GAS.—The most frequent cause of coal-gas poisoning is carelessness in turning-off, or rather not turning-off, bedroom gas-jets.

Symptoms.—The patient rapidly becomes unconscious, and is, therefore, powerless to help himself. This state, combined with smell of gas in the room and the patient's breath, are the best symptoms to guide one.

Treatment.—Plenty of fresh air, smelling-salts to the nose, mustard to the calves, and, if the patient can swallow, a small quantity of stimulant. Use artificial respiration as described in the section on "Drowning."

CHLORODYNE.—A patent medicine largely used as a popular remedy for diarrhœa and sleeplessness; contains morphia.

For *symptoms* and *treatment*, see OPIUM.

COPPER.—Poisoning from copper usually occurs from partaking of food contaminated with some copper compound, introduced either by its being cooked in a copper vessel or for colouring purposes. If copper vessels are used in cooking operations, the greatest care is needed. They must be kept scrupulously clean, and food must not be allowed to cool in contact with the metal. "Blue-stone," a preparation of copper sometimes used for agricultural purposes, has been eaten by children in mistake for sweetmeats.

Symptoms.—Coppery taste in the mouth, griping, vomiting, and sometimes purging.

Treatment.—An emetic of tepid water or mustard, followed by

draughts of tepid water. Abdominal pain will be eased by warm fomentations.

A very simple test will detect copper in any article of food. Plunge a bright knife-blade into the suspected material, and leave it for a few minutes; if any copper be present the knife-blade will assume a red coating.

Corrosive Sublimate or Perchloride of Mercury.—This substance is extensively used by bird and animal-stuffers to prevent decay; it is also used as a disinfectant, and is a powerful corrosive poison.

Symptoms.—Metallic taste in mouth. White patches on lips, which are usually swollen. Purging and vomiting.

Treatment.—Give an emetic of mustard at once, and follow it with white of eggs beaten up in water. The white of egg is the direct antidote, and can be given in any quantity.

Coloured Chalks or Crayons.—These are frequently sucked or eaten by children, to whom they are attractive on account of their gaudy colours.

Symptoms.—These will vary with the composition of the chalk.

Treatment.—The safest course to pursue is to give an emetic, followed by a full dose of castor oil.

Foxglove, or Digitalis.—A well-known flowering plant, found growing both wild and cultivated in nearly all parts of Great Britain. May be taken accidentally by children.

Symptoms.—Purging and vomiting. Delirium and insensibility. Stoppage of urine.

Treatment.—An emetic, followed by strong, hot tea. Hot gin and water. Do not let the patient rise from the bed.

Hair Dyes.—Most of these preparations contain either lead or silver. If any such preparation be accidentally swallowed, give an emetic of hot water, followed by plenty of milk.

Hemlock.—There are several plants closely allied which are commonly known as hemlock. They all grow wild in various parts of the country. The true hemlock or spotted hemlock is easily recognized by two well-marked characters, viz., the round, smooth stem and the peculiar odour of mice which is given off from every part of the plant. One variety resembles common parsley, and has often been mistaken for it. It goes by the vernacular name of "Fools' Parsley."

Symptoms.—Staggering gait and general loss of power in the limbs, indistinctness of vision.

Treatment.—Emetics; strong tea; stimulants if there are any signs of collapse.

Holly.—The red berries of the holly have been frequently eaten by children, and poisoning effects have been produced.

Symptoms.—Vomiting, purging, and drowsiness.

Treatment.—Emetics. Hot-water bottles to the extremities, and hot coffee as a stimulant.

Laburnum.—This tree is well known under the name of "Golden Chain," its chains of golden yellow flowers forming a common ornament of gardens. All parts of the tree are poisonous. Children are usually the sufferers from this kind of poison.

Symptoms.—The effects are produced very quickly—vomiting and convulsive movement of the body followed by insensibility.

Treatment.—Give an emetic—cold water poured on the head and chest. If there is much exhaustion, a *small* quantity of brandy may be given, but stimulants must be used with caution.

Lead.—Poisoning from lead usually assumes a chronic form, and is therefore beyond the range of ambulance articles. It may be introduced into the system in many ways, such as by water contaminated from leaden pipes or cisterns, from cider, wine, or beer stored in lead-glazed jars, etc. All these cases would obviously come under the notice of a medical man. It is, however, quite possible that, through a mistake, sugar of lead, or white lead, may be taken accidentially, and in view of such a case I append the symptoms and treatment. It must, however, be understood that these apply only to cases of acute poisoning.

Symptoms.—Metallic taste in the mouth, griping pain, general cramp.

Treatment.—Give an emetic, followed by Epsom salts dissolved in water.

Lords and Ladies, or Cuckoo-pint, sometimes also called Friar's Cowl, grows wild in shady places and by the ditch sides all over the country. The root of this plant furnishes that kind of arrowroot known as Portland, and great care has to be exercised in the process of manufacture to ensure the complete removal of the acrid poison which both root and leaves contain.

Symptoms.—Swelling and blistering of tongue and lips, vomiting and purging. In severe cases there may be convulsive fits.

Treatment.—Give an emetic of mustard and water. If there is much pain, apply warm fomentations over the stomach.

Lunar Caustic, or Nitrate of Silver.—A white substance

usually found in sticks. The chief domestic use is for *burning* warts, etc. It is largely used by the photographer.

Symptoms.—Pain, metallic taste in mouth. Lips and tongue covered with white streaks and patches, the skin round the mouth may be blackened or of a brown colour.

Treatment.—Give freely of common salt dissolved in water. White of egg beaten up with milk.

LAUDANUM owes its poisonous properties to OPIUM, the active principle of which is morphia. One or other of these substances is frequently the most important ingredient in soothing-syrups, teething-powders, etc. PAREGORIC, again, contains opium, and many an infant has had its cries silenced with one or other of these concoctions once too often. In these days, when there seems to be a passion for patent medicines, it is well to bear in mind the dangerous nature of some of these cures for all diseases, and especially those intended to soothe children. Children are much more sensitive to the effects of opium than adults, and, unfortunately, every medical man is acquainted with the effects of chronic opium poisoning amongst children, especially in manufacturing districts. These effects are known to be due to the custom of *soothing* restless children with continued doses of one or other of these noxious preparations.

Symptoms.—The first symptom, viz. excitement, may pass unnoticed, but drowsiness ending in deep sleep from which it is difficult to rouse the patient soon supervenes, and this is almost sure to attract attention. The skin becomes cold and the lower jaw falls.

Treatment.—It is most important to keep the patient from sleeping. This is a point that should never be lost sight of. Once let sleep get the mastery, and the chances of recovery are slight. Walk the patient up and down a room, or, better, an airy corridor. Slap the face and chest with a wet towel, apply smelling salts to the nose and mustard poultices to the legs. Give hot coffee or powdered galls, but avoid alcoholic stimulants in any form.

MUSHROOMS AND POISONOUS FUNGI.—Poisoning from eating mushrooms or other fungi which often go by that name, is somewhat common, and it must obviously remain so until we learn more about the chemical composition of the different varieties so as to be able to distinguish with certainty those which are not poisonous from those which are. At present the most conflicting statements are made even by scientific authorities on these points. The following may be noticed as helping the mushroom-gatherer

in his choice, or as a guide to those who are willing to risk the danger they undoubtedly run in eating such delicacies.

Avoid all fungi which grow in shady localities and round the trunks of trees. Those which are moist on the surface are always poisonous. All coloured fungi are poisonous, as are also those which become blue on exposing a cut surface to air.

The taste of the raw fungus has been held by some to be a sure guide, the poisonous varieties having an astringent, unpleasant taste. But this is very doubtful; the so-called cultivated taste is so peculiar that what is a sweet-tasted *bonne bouche* to one proves as nauseous as a dose of physic to another. Even the true edible mushroom may become poisonous under certain conditions of climate, locality, and preparation.

Symptoms.—Vomiting and purging, signs of intoxication, severe colic, unconsciousness.

Treatment.—An emetic at once; the handiest is the ever-useful mustard. Give a full dose of castor oil, and, whilst awaiting the arrival of the doctor, administer stimulants if there are any signs of collapse.

Mussel and Shell-fish Poisoning.—The same element of uncertainty as to the exact cause is present in this as well as the last form of poisoning. Eat no shell-fish which have been attached to ships, or which have been taken out of harbours or near sewage openings.

Symptoms.—At first those of indigestion, and weight in the stomach. The skin becomes itchy and the eyes swollen and inflamed, the inflammation often extending to the face, the patient presenting all the appearance of one affected with erysipelas. Vomiting and purging, followed by collapse, if the case be a bad one.

Treatment.—Give an emetic. Follow with a full dose of castor oil. Keep the feet warm with hot bottles. If any signs of exhaustion, give alcoholic stimulants, such as brandy and hot water.

Nux Vomica.—This substance is largely used as a rat-poison. It, or its active principle Strychnine, enters largely into the composition of many vermin-killers. Battle's, Butler's, and Gibson's vermin-killers are known to contain this substance as the poisonous ingredient. As game and other birds often fall a victim to the dose intended for their enemies, deaths have been known to occur through partaking of food so killed.

Symptoms.—These are so well marked and so thoroughly charac-

teristic that recognition of the cause is not very difficult. It is only right to mention that a disease (tetanus) sometimes following wounds closely resembles the appearance of nux vomica poisoning, but beyond mentioning the fact it would be out of place here to say anything further.

The patient at constantly occurring intervals is thrown into violent convulsions. Each convulsive fit may last from three to five minutes. The body becomes arched.

Treatment.—Unfortunately, but little can be done in a case of this sort except by a medical man. If the symptoms are observed in time an emetic should be given, but after convulsions have fairly set in there will be considerable difficulty experienced in effecting even this simple operation.

PARAFFIN OIL AND PETROLEUM.—These substances notwithstanding their objectionable odour and taste, are often taken in mistake for more palatable fluids, and sometimes, strange to say, are chosen by the suicide as a means of destroying life.

Symptoms.—The smell of the clothes, breath, or any vomit would at once give a sure clue to the nature of the poison. There is usually vomiting; great excitement, followed by insensibility.

Treatment.—Give an emetic, keep the feet warm, and, if there be any signs of collapse, give stimulants.

PHOSPHORUS.—Phosphorus may be taken in many ways. The heads of a few common matches are quite sufficient to cause serious symptoms. Phosphorus paste is frequently used as a rat poison.

It is always a matter of surprise that the general public prefer the common lucifer to the patent safety. By using the latter they secure many advantages. In the first place, there is not so much risk from fire; secondly, they are not poisonous; and lastly, the manufacture has not cost the workmen their health or their lives, as is the case with the makers of the common match. In a word, there are two kinds of phosphorus—one harmless, the other poisonous. The former variety is used for the patent safety match, and the latter for the common match. We are wonderfully conservative on these points, and one may suppose that as long as common matches are manufactured, so long will they be used, and so long also will our children suck the ends off and suffer from the results.

Symptoms.—Pain in stomach, vomiting, smell of phosphorus in breath. (In the dark, all vomited matters are luminous.) Faintness, sometimes followed by insensibility.

Treatment.—Send to the nearest druggist's for an emetic of sulphate of zinc—twenty grains, dissolved in water, is the dose. Give it at once, and while awaiting the arrival of the doctor keep the body warm with hot bottles.

PRIVET.—A common hedge plant, growing in all parts of the United Kingdom, and too well known to need a detailed description. The berries are frequently plucked and eaten by children. All parts of the plant appear to be poisonous.

Symptoms.—Vomiting and purging, accompanied with pain. There may be convulsions in a severe case.

Treatment.—Give an emetic of mustard and water, and encourage vomiting with tepid water.

SALTPETRE.—This substance is not popularly supposed to be a poison, but it has several times been taken in mistake for Epsom salts and other substances, and produced dangerous symptoms and even death. The keeping of powders in unlabelled packages is a fertile source of accidental poisoning in the household; a little care and order in this respect may save the life of one we love.

Symptoms.—Burning pain in stomach and bowels; vomiting; and convulsive movements of the limbs.

Treatment.—An emetic is useful if administered soon after taking the poison. Give white of egg beaten up with milk. Olive oil in small doses (a dessert-spoonful) at frequent intervals. If there are any signs of exhaustion, brandy and hot water. Keep the patient warm with hot bottles to the feet and body.

STINGS AND POISONOUS BITES.—The irritation following the bite or sting of snakes and various insects is due to the introduction of poisonous matter into the wound. The sting of wasps, bees, hornets, etc., are of somewhat common occurrence in this country; but the only venomous snake met with is the adder or viper.

The *symptoms* need not be described, as some effect immediately follows the cause.

Treatment.—In the case of a sting, first extract the sting, if possible. This can be done either with a clean needle, or by pressing a watch-key over the spot. Wash the wound in a solution of baking soda in water. In nervous people, signs of shock and exhaustion sometimes follow a bee-sting, and stimulants may be useful. The juice of onions has also been highly recommended as a remedy for the stings of bees and wasps.

In the case of a snake-bite, at once tie a ligature tightly above the wound, that is, between it and the body. If any one is present

with sufficient nerve, the wound may be cauterized with a red-hot poker. This, however, must be done immediately to be of any service.

Give stimulants very freely, either whisky or brandy. The patient may be made intoxicated, it will prevent more dangerous symptoms arising; and it must be remembered that, after a snake-bite, it requires a considerable amount of alcohol to produce alcoholic excitement.

This mode of treatment is common in American settlements, and experience has shown that it is successful even after the bite of dangerous varieties of reptiles.

WHITE PRECIPITATE.—Occasionally used as an outward application in domestic medicine. Commonly found in the house, however, in the form of an ointment. It is not a very powerful poison, and, although it may produce somewhat alarming symptoms, no great danger need be apprehended unless a large dose has been taken.

Symptoms.—Purging, with severe pain; vomiting, and cold clammy skin.

Treatment.—Give an emetic at once, followed by white of egg beaten up with milk.

YEW.—This favourite tree is poisonous in all its parts, the leaves are sometimes chewed, or the berries eaten by children.

Symptoms.—Convulsions and unconsciousness, coldness of the body. There may be vomiting.

Treatment.—An emetic, followed by hot water and brandy, somewhat freely administered. Keep the patient warm, and lying down in bed for some time after all dangerous symptoms have disappeared.

ZINC.—This metal is used (practically) under the name of GALVANIZED IRON, for making pails and cisterns for water. Under certain circumstances the zinc dissolves to a sufficient extent to render the water poisonous. The SULPHATE OF ZINC or WHITE VITRIOL is in common use, as also the chloride, which is the basis of many soldering fluids and Burnett's disinfectant, a preparation not so popular now as it once was.

Symptoms.—The white vitriol would in all probability act as an emetic. The chloride is a corrosive poison. There would be great pain, with white, corroded patches on lips and mouth.

Treatment.—Baking soda dissolved in water; olive oil freely If much pain in the abdomen apply warm fomentations.

This concludes our list of the poisons most likely to be met with in everyday domestic life, and I must ask my readers to remember the spirit which has prompted and guided me in writing these instructions. They are not intended to serve as a complete guide to the domestic treatment of a case of poisoning. To give the patient a fair chance of recovery, a medical man's aid must be sought. Before his arrival, much may be done by an intelligent person, and I trust my directions have been explicit enough to enable my readers to do much in the right direction, and thus to aid the subsequent more scientific treatment by the doctor.

In glancing over our short dictionary, for that is really what I have made it, it will be noticed that the treatment of any case of poisoning may be classed under one or other of several headings. In one class you can give an emetic. In the other an emetic is prohibited. *Where there are no signs of corrosion or burning about the mouth and lips, give an emetic, and the safest is mustard and warm water. Where these signs are present, however, you dare not give an emetic, but you can administer oil.* If there are any signs of drowsiness keep the patient awake by walking him up and down a room, or slapping him with a wet towel.

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CHAPTER XIII.

THE AMBULANCE ARRANGEMENTS OF AN ENGLISH ARMY CORPS IN WAR.

THE subject of the ambulance arrangements of an army in war is so interesting to many people, and is so little understood by persons outside the army, that I avail myself of this opportunity to briefly describe it in outline.

The question really is, through what hands and through what different organizations does a wounded soldier pass, from the time a bullet strikes him when engaged with the enemy in the front of the army, until he finally reaches England?

We all know that if an accident of a serious nature happens to a citizen in a civilized country, he is carried to his home, or to the nearest hospital; but what is not understood is the method of work of those who are charged with the medical care of a soldier wounded, say at Gubat or Metemneh, until he finally arrives in his English home.

To understand this system it is needful to briefly explain the military organization of the army, and then to describe the regimental aid, the bearer company, the field hospital, the sick convoy, the stationary hospital on the line of communications, the base of operations, and finally to the large English military hospitals, where a soldier remains until he is returned to his duty or discharged from the army.

My main object in putting together these few paragraphs is to invite public attention to the entirely defective arrangements for medical organization existing in the volunteer service. These are so indifferent, and, indeed, so completely absent, that any attempt at mobilizing the volunteer army in case of invasion would be impossible from absence of a regularly organized medical department, and owing to there being no definitely trained medical service for the volunteer army, we lose in the regular service the valuable aid in a great war which volunteers willing to come to us for the campaign would give.

There is no doubt whatever that if there was in England a well-organized ambulance service for the volunteers, that, in addition to completing our home defence, many persons so trained and disciplined would come forward like the volunteers in the Army Postal Corps and in some of the volunteer regiments, and serve for a campaign. We cannot in war time accept voluntary aid, however enthusiastic and willing, unless it be trained and disciplined.

We need trusty men who will stand by their duty—their irksome duty—inspired by feelings of duty in the highest degree, and we cannot in the hurry and confusion of a great war outbreak, choose at once such men untaught and unorganized.

At the outbreak of the 1882 campaign hundreds of ladies rushed forward to volunteer as war nurses, alleging in some instances the most absurd reasons why they should be chosen, but quite ignoring the fact that they knew nothing of nursing as it now is—viz., an organized profession, that must be studied. Their enthusiasm, which was really a revolt against eternal lawn-tennis, was great, but their ignorance was profound.

If men or women desire to aid the country in war in any branch of the military service, the path is plain and easy; they must in the tranquil days of peace submit to the discipline, the sacrifice of time, and the labour needful to qualify themselves.

In medical volunteer corps, such as I suggest in this paper, whether of women or men, the training for war work can be developed in peace times.

The scheme of organization of the medical service in war is based on an army corps.

It is impossible to work on a smaller scale in a large army, as the whole principle of modern war is to remove the wounded and the sick as quickly as possible from the front of the army. Nothing encumbers the rapid movements of an army more than the presence of a number of sick and wounded, and as war to-day is extremely rapid—empires toppling over in weeks—it becomes essential for victory to have a complete scheme for the removal of the greatest of all *impedimenta*—viz, the helpless sick or wounded soldier.

I have written the following account in the form of a catechism, as it forces one to keep more to the point, and, as the subject is very large and diffuse, this is needful. Those who desire fuller information on the subject can read "The Army Medical Regulations, 1885," to be obtained at any military bookseller's for 2*s.* 6*d.*; "The Handbook on Ambulance Organization and Transport," published by the Health Exhibition, 1884, 1*s.*; "The Manual of Instruction for the Medical Staff Corps," etc.

Q. What is the largest organized unit of the English army?—*A.* The Army Corps, numbering 36,000 men, with 12,900 horses and ninety guns. It is on this basis that the scale of the component parts of an army are laid down.

Q. How is an army corps made up?—*A.* By three divisions of the army, together with one cavalry brigade and a body of troops called the corps troops, consisting of the reserve artillery (thirty guns) and some companies of engineers, with telegraph equipments. It is commanded by a general.

Q. What is a division of the army?—*A.* It is composed of two infantry brigades, one regiment of cavalry, one regiment of rifles, three batteries of field artillery, one company of sappers, two bearer companies, and four field hospitals of the Medical Staff Corps, with commissariat, transport, veterinary, military police, and chaplain's departments. It is commanded by a major-general, and it has for a principal medical officer a deputy-surgeon-general.

Q. What is a brigade?—*A.* Three battalions of infantry constitute a brigade, and three regiments of cavalry form the cavalry brigade which has also with it a battery of horse artillery. It may be commanded by either a brigadier-general or a major-general.

Q. What is the base of operations?—*A.* That port or other place where an English army lands in an enemy's country, and where all the stores and reserves of the army are placed.

Q. What is the line of communications?—*A.* That road or roads by which the army advances against the enemy, and along which reinforcements and provisions are forwarded to the army, and along which the sick and wounded returning from the front reach the rear.

Q. What are the *étappen posts*?—*A.* They are the various stages or halting-places on the line of communications held by our troops as they advance, and where supplies of food and ammunition are stored.

Q. What are the medical arrangements of an army corps?—*A.* There is with every army corps a surgeon-general who is responsible for the whole of the medical arrangements of the army, from the fighting line in front to the hospital ships at the base of operations. He is on the staff of the general commanding the army corps. There is also a principal medical officer for the communications, and another for the base; they are subordinate to, and carry out the orders of, the surgeon-general of the army corps.

Q. Define the medical units.—*A.* In war time there is with every battalion, battery, cavalry regiment, and engineer company a medical officer of the regular army. He is the medical officer of the unit, and he has with him a sergeant or corporal, and from two to four men per company from the battalion, who act as ambulance men and form the *regimental ambulance detachment.* These men wear the regimental uniform, and are instructed in ambulance drill and first aid to the wounded. In the volunteer army they wear the Geneva Cross on their right arms. There is also a medical box, called a *Field Companion*, containing bandages and dressings, and every battalion should have a pair of panniers, for a mule or pack-horse, containing medicines and bandages.

Q. What is the function of the regimental ambulance detachment?—*A.* They pick up the wounded of the battalion as they fall, carry them to the surgeon, give water and brandy to the wounded, and assist at the first hasty dressing on the field.

Q. Where are these men now generally to be seen?—*A.* In most volunteer regiments. They form the regimental ambulance detachment, and are not to be confounded with the *bearer companies of the division*, which are non-regimental, and belong to the Medical Staff Corps.

Q. Is not this regimental aid amply sufficient for an army?—*A.* No; it was belief in this idea which caused much suffering in former wars. If you trust to battalion aid only, after any fight, say with even two or three hundred wounded lying on the field, the

moment the army tries to advance to pursue the retreating enemy, this question arises—Who is to remain with the wounded to care for them on the field, and finally to transmit them to the rear? Trusting to battalion aid, one of three things must occur. Either a scratch team of surgeons and men must be detached from the battalion, allowing the battalion to go forward without surgeons, or the surgeons will go forward with their regiments, leaving the wounded to chance, or the whole army must halt on the spot and lose valuable time, while a part of it returns with the wounded. All this is avoided by a definite army corps organization of medical war units beforehand.

Q. What are the other medical units?—*A.* The bearer company, the field hospital, the stationary hospitals on the communications line, the base hospital, the hospital ship, and the great receiving hospitals in England.

Q. What is a bearer company?—*A.* It is a body of three medical officers, one quartermaster, and fifty-seven sergeants and men of the Medical Staff Corps, with ambulance waggons, surgery waggons, blankets, food, medicines, instruments, chloroform, operating tents, and all the *matériel* for giving to the wounded more complete help and assistance than could be given by the battalion surgeon.

Q. How do they work?—*A.* There are two such companies in each division attached to the infantry brigades. The companies each form a dressing-station in rear of the battle, and send forward their waggons and men to a *collecting station* close under fire. Here they receive over and assist in collecting the wounded from all the regiments and batteries of the brigade or division, and from thence they convey them to the dressing station for operative aid, fuller dressing, food issues, and shelter, until they can be removed to the field hospitals in the rear.

Q. How is the dressing-station distinguished?—*A.* By a large Red Cross flag, and to it all badly wounded are carried, and the slightly wounded walk.

Q. What next happens to the wounded?—*A.* They are then gradually carried from the dressing-station to the field-hospitals in the rear of the fight.

Q. What is a field hospital?—*A.* It is a lightly equipped tent hospital, with portable equipment, carried in waggons or on pack-saddles, and ready to nurse one hundred sick men. It has four medical officers, one quartermaster, and thirty-four sergeants and

men of the Medical Staff Corps. It has tents, blankets, cooking vessels, medicines, instruments, water-carts, and a staff of men as nurses, cooks, dispensers, messengers, washermen, watermen, pioneers, and officers' servants.

Q. How many field hospitals are with each division?—*A.* Four, making twelve for the three divisions, and there is one with the cavalry brigade and one with the corps troops. To them the wounded men are removed, and they remain in them until they recover if slightly wounded; and if seriously hit they are carried by sick convoys to the stationary hospitals at the *étappen posts* on the communications line.

Q. Whence have we copied this system of work?—*A.* Mainly from the German army, and it is now copied by all the European armies.

Q. What are the stationary hospitals?—*A.* They are eight hospitals, each for two hundred sick, fully equipped with all things needful for the nursing and care of the men. They have ten medical staff officers, and sixty-five men of the Medical Staff Corps, and they are formed on the communications line as the army advances. The field hospitals are completely mobile, having transport attached to them, and they follow up the army as it advances, handing over the sick to the stationary hospitals as the latter come up from the base and the rear of the army.

Q. How many general hospitals are there with an army corps?—*A.* Two; each for five hundred sick. One may be placed at any large town on the communications, but one is always placed at the base, and is called the *base hospital.* In it large gatherings of sick take place prior to their being embarked for England in the hospital ships.

Q. Name a historic general hospital?—*A.* Scutari, opposite Constantinople, used during the Crimean campaign. Owing to the want of a trained medical corps and proper preparations for war in time of peace, great confusion and suffering took place there in 1854.

Q. Has this been now remedied?—*A.* Yes; a regularly trained medical staff corps is now embodied in the army, trained in peace for the labours of war.

Such a corps did not exist in 1854, and a collection of untrained pensioners of worn-out physique and defective morale were hurriedly sent out to organize this great hospital.

After the Crimean campaign, a new medical corps was raised, and, after varying changes, is now known as the Medical Staff

Corps. It consists of storekeepers, compounders of medicine, nursing orderlies, clerks, cooks, and the various fatigue men needed, such as conservancy men, washermen, watermen, and messengers in working a hospital.

Q. What is a hospital ship?—*A.* It is a vessel regularly fitted up as a floating hospital, and it has on board a regular staff of army surgeons, medical staff corps, nursing sisters, cooks, washermen, and all the staff of a working hospital. The sick are received on board this vessel at the base of operations, and are either carried to England in this vessel or transferred to the sick transport ship for the purpose.

In the late Egyptian expedition, the hospital ship *Ganges*, under the direction of Brigade-Surgeon Gribbon, achieved an immense amount of work, and may be considered as having reached a high pitch of perfection. After the campaign it was constantly employed in voyages, to and fro, from Egypt to England, conveying home relays of sick and wounded in absolute comfort. Compared with the sick transport service of 1852–55, there is in this matter absolutely no comparison.

As a nation, we have probably achieved the highest efficiency in hospital ships that has yet been attained.

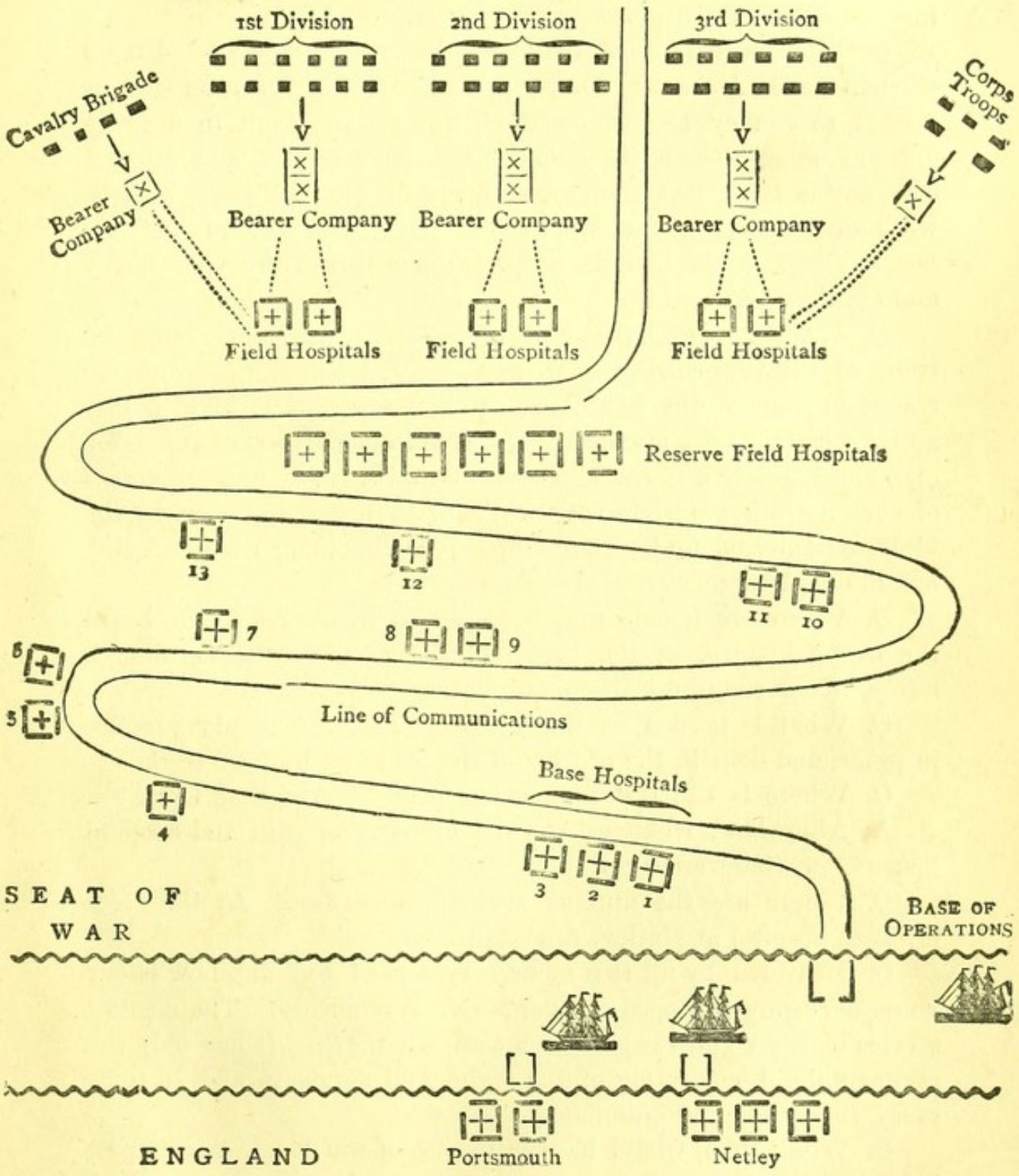
Q. Trace the course of a wounded soldier from the time he is hit in battle until he reaches England?—*A.* He is hit by a bullet in No. 1 Company, 1st Battalion, 1st Brigade, 1st Division, and he falls to the ground. The regimental ambulance men pick him up, give him water, stop excessive bleeding, and carry him to the regimental surgeon.

Q. What then happens?—*A.* The regimental surgeon examines the wound, and gives it a rough dressing, and probably, if it be painful, gives the man a hypodermic injection of morphia. He then tears a label out of his book, and marks on it the name of the man, his wound, and his treatment, and sends the man from the front to the *collecting station* of the brigade or divisional ambulance company.

Here the man is taken into an ambulance-waggon and carried to the dressing-station, where he receives soup, wine, brandy, and is specially examined, and, if it be urgently needed, operated upon. Here, if it be night, he may remain covered by blankets and warmed by a fire, and at the first opportunity he is sent to the field hospital.

When he arrives there, if he be slightly injured, he is kept until

recovery; but if he is badly hit, he is, after a day or two, sent back, stage by stage, from *étappen post* to *étappen post* by sick convoy until he reaches the great general hospital at the base of operations —*vide* plan.



Here he may recover, and be sent back with a detachment to join his regiment in front; but if he be still ill and no hope of his immediate recovery exists, he is put on the hospital ship, and sent

home to Netley, or Portsmouth, or Woolwich. He may perhaps be stopped at Cyprus or Malta for change of air. On arrival in England, he is cared for in hospital until he recovers and joins his depôt or regiment in England, but if he continue ill he may be invalided with a pension out of the army.

Q. What is still needed to render the care of the wounded more efficient?—*A.* A bearer company for the communications-line is needed to convey the wounded back from the front in a really efficient manner, and in good ambulance-waggons, and another company is needed at the base of operations for the heavy fatigue work of embarking the wounded from the railway to the base hospital and to the hospital ships. These duties are very heavy and exhausting.

Q. What is an ambulance train?—*A.* It is a regularly equipped train of railway carriages, with a passage through it from the engine in front to the guard's van in the rear. It is divided into ambulance carriages, store carriages, cooking carriages, dispensaries, etc., and is really a movable hospital on rails. The best specimens of such a train are those of the Austrian army, equipped by the Maltese Knights, under Baron Mundy's direction; each carrying one hundred wounded and attendants.

Q. Where are female nurses employed in war?—*A.* On board the hospital ships, at the base hospital, and sometimes, though rarely, in the communications hospital.

Q. What is needed for all this work?—*A.* A regular practice in peace, and drill in the routine of the field and hospital work.

Q. Where is the training depôt of the Medical Staff Corps?—*A.* At Aldershot; where all recruits are sent for drill and hospital instruction wherever recruited.

Q. Where are the nursing sisters trained?—*A.* At the great military hospital at Netley, near Southampton.

Q. Measured by all this modern system of war aid, how is our volunteer army equipped for war?—*A.* Wretchedly. The medical service of the volunteer force is a complete myth. It has only the regimental aid, consisting of the regimental surgeons, and, in some cases, the regimental ambulance bearers.

Q. What, then, would happen in case of war?—*A.* A complete breakdown would happen, as there is not a bearer company or a field hospital equipment in the whole force. The volunteer army can shoot, and can march past; but it has no organized medical service, no transport, no commissariat, and is like the English army

during the Crimean campaign—ready to break down in the field for want of definite forethought in peace.

Q. How do you account for this condition of affairs as far as the medical service is concerned?—*A.* It is owing to the ignorance of the medical profession in civil life as to what military organization for war really means, and the absence of any personal knowledge on the part of the nation as to the horrors of war and the impossibility of improvising everything when war is actually raging.

Q. Would it be difficult to place the ambulance and medical service of the volunteers on a really efficient footing?—Nothing could be easier. The Swiss have a medical service as efficient as any in Europe, and it really amounts to a well-thought-out volunteer system.

Q. What is needed to be done?—*A.* Every English county should organize a bearer company, and a field hospital for one hundred beds. This would require about ten surgeons, two quartermasters, and about one hundred non-commissioned officers and men of a volunteer medical staff corps, drilled, dressed, and disciplined like the Medical Staff Corps of the regular army. These officers and men would receive capitation allowance, like ordinary volunteers, and would go through all the war routine in peace.

Q. What further steps would be needed?—*A.* All medical students should be asked to go through a course of voluntary ambulance drill and field hospital instruction, so that when they passed into civil practice they might, if they desired it, be able to command the volunteer bearer companies and field hospitals in the various large towns and counties.

If such a training were given at the medical schools, when war broke out, doubtless a number of young surgeons could also join the army as temporary aid, as volunteers for the war, and would thus gain much useful knowledge, as well as take their share in the national service.

In continental countries the conscription and universal military service places at the disposal of the State a large body of medical men, chemists, nurses, etc.; an aid not available in England, but which a good volunteer system would provide.

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