

MOUNTAIN RESCUE IN WAR AND PEACE

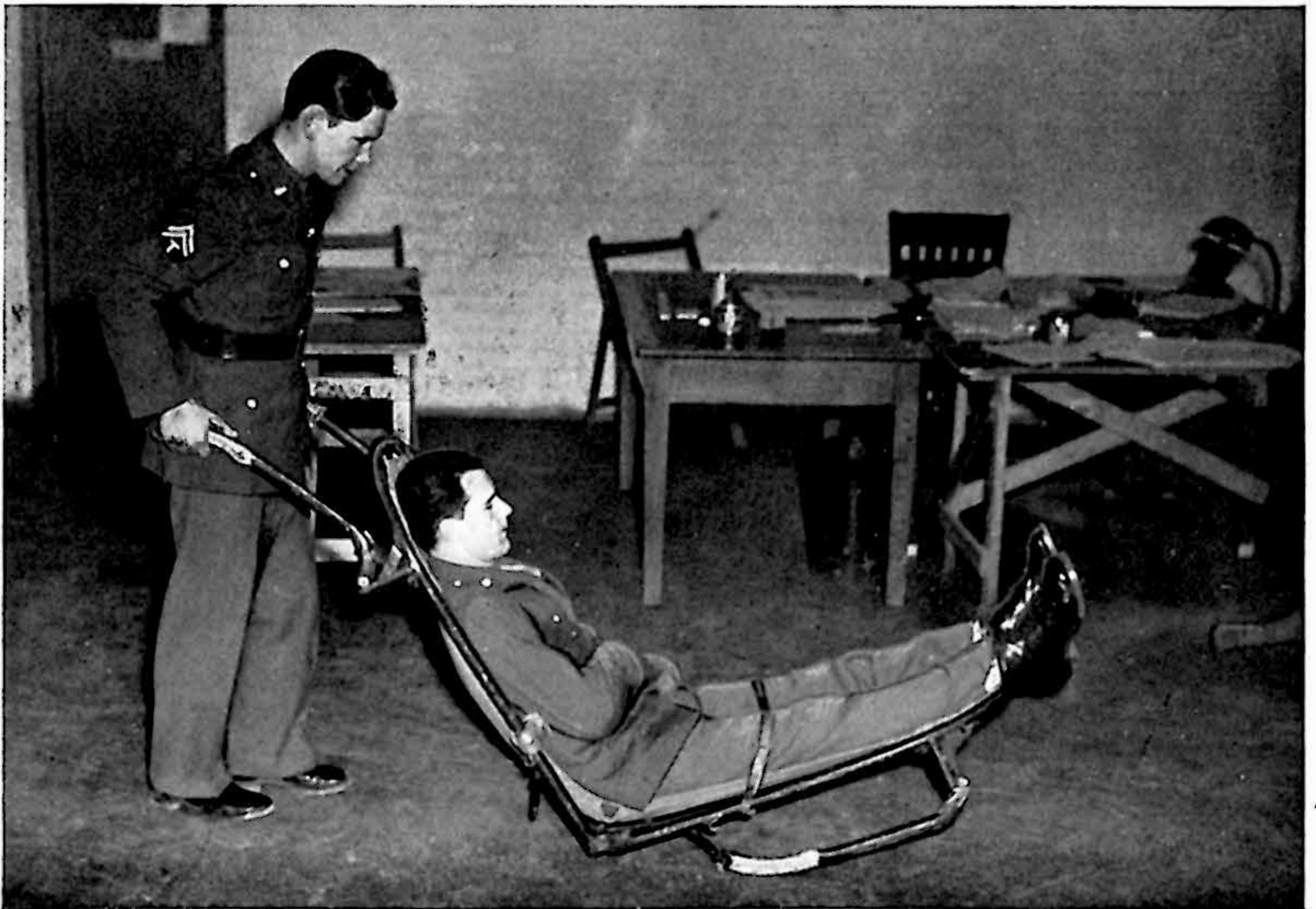
THE following notes are in continuation of the subject which was presented before the Alpine Club on February 6, 1945, in the series of papers read by Dr. Raymond Greene, Flight-Lieut. J. C. Lloyd and Mr. A. S. Pigott. We are grateful to Dr. Raymond Greene for adding certain comments.

MAJOR N. E. ODELL.—Dr. Raymond Greene's remarks (Part II) are of the greatest importance, since they are based upon his wide experience under the varying conditions of peace and war necessity. While engaged in the training of Commando and other special units during the war, I have frequently had the advantage of Dr. Greene's help and advice, and I would like to pay a tribute to his expert assistance.

There is no doubt at all that in Dr. Greene's one-man carrier for casualties (the Greene carrier, as it is now well known in the army) we have a first class contrivance, with advantages in weight and otherwise over even the excellent Swiss Arcioni frame. Moreover, it should be understood that the former is not only a casualty carrier, but also can be used for general loads. It is definitely a great improvement on the Bergan frame as later embodied in the Everest carrier. It is possible that the use of cane may not have much, if any, advantage in weight, apart from strength, over some of the best and lightest aluminium-magnesium alloys. In addition to its proved advantages to mobile troops, there can be no doubt that the Greene carrier should be available as an item of first aid stores in our mountain centres and huts. There are many occasions that may arise when one-man transport of casualties may with advantage, or of necessity, be adopted.¹

Having had exhausting and unforgettable struggles on mountain sides and other steep ground with the Service Mark II, and similarly unsuitable flat land stretchers, in the conveyance of agonised casualties, I cannot too strongly condemn its continued and widespread use in mountain resorts in this country. There is no doubt whatsoever that the Swiss Army has evolved in the Koller stretcher, as instanced by Dr. Greene, a first rate device with a remarkable number of special advantages, which has put every other mountain stretcher, *qua* stretcher, out of date. Its great advantage, from the point of view of the casualty suffering from abdominal and allied injuries, of being flexible in the middle, so that the case is suitably and comfortably flexed, places the design in a class by itself. In view of the conclusions arrived at by the expert advisory committee, and the many advantages of the Koller stretcher which were generally admitted, it would appear that the War Office is strongly to be censured for not adopting it for the Army.

¹ I am rather doubtful about this. The use of the carrier for casualties, as opposed to loads, requires training.—R. G.



THE KOLLER STRETCHER.

By courtesy of Photographic Section, Office of the Chief Surgeon, ETOUSA.

Any excuse on the score of difficulty of supply should not have been allowed to stand in the way in a matter of such urgent necessity.

The Koller stretcher (without its wheels for road use) has actually an advantage of 10 lb., or more, in weight over the Thomas stretcher, apart from a number of other outstanding superior features, and I would like to see the former installed in every climber's resort in the mountains and hills of this country. It is a matter which should have the immediate consideration of the First Aid Committee of Mountaineering Clubs, and a model should be procured for early demonstration to sceptics. Far too long have we been struggling with inferior articles. I have not seen the Duff stretcher, but there seems no doubt that it cannot be placed in the same category as the Koller, if only on account of the impossibility of flexing and collapsing the former. The same criticism applies to the Airborne stretcher, with which I am acquainted, and which is quite unsuitable for mountain work.

An essential feature of any mountain stretcher should be the provision of runners for sliding down steep inclines, as is now generally agreed; and the model (such as the Koller) which, in addition, can be fitted with wheels for conveyance on paths and roads, apart from its being collapsible into a one-man load, has obvious merits that warrant its widespread adoption.

The interesting contribution by Flight-Lieut. J. C. Lloyd brings out the prime necessity for efficient team work in all mountain rescue work, and indicates the great advantage to be obtained with light portable wireless communication.

From Mr. A. S. Pigott's paper one gathers that although considerable progress in certain directions has been made by the First Aid Committee of Mountaineering Clubs, and examination of many types of stretcher, it is claimed, has been made, yet no trials appear to have been carried out either of the Koller stretcher or of the Greene carrier. As emphasised above, it is earnestly to be hoped that this position may be speedily rectified, and that the Committee's findings will concur with those of so many others, here and on the Continent as well as in America, who recognise the outstanding merits of these particular contrivances.

MR. WILSON H. HEY.—Transport is not all the problem of mountain rescue. My personal experience shows that rescue in war and peace presents two different problems. The climber must have far better service than is given to the soldier in spite of the trained organisation given to the latter.

Two types of man-handled vehicles will be required; one to get the wounded off difficult terrain, that is, ice, rock and scree; and another to take him swiftly down moor, grass, snow and track.² The former will go into action shortly after the accident whilst the latter is being brought up from the valley. The papers published last May

² I believe that the Koller with detachable wheels fulfils both purposes.—R. G.

demonstrate the possibilities of developing these combined tactics. Agreement between bearers, doctors and wounded will never be reached because of the varying wounds, terrain and physique of the climbers.

There is so much to discuss in mountain rescue that I will merely suggest the beginning and the end. The problem begins *before* the accident. The leader and his second who do not know every link in the chain ending in the best hospital are like a general and his Chief of Staff who have learnt only offensive action, who have never been taught the principles of retreat. If this thought and knowledge is necessary for every climber, I hear you say, 'What a gruesome game! It will change us into mountaineering neurotics.' If the study of first aid routes of evacuation will convert a leader into a neurasthenic and destroy his climbing initiative he should stop leading. Surely he has a greater duty to his party than to bring them alive or injured to one or other end of the climb. Limbs and lives have been lost because the mountaineer begins to think *after* the accident when his mind is not as clear as it ought to be.

Our accident reports show that simple common sense facts are insufficiently appreciated by our climbers. Warmth and freedom from pain are of far greater importance than speed on the best stretcher. Every stitch of useful clothing should immediately go from the climber on to the wounded. Even a semiconscious man knows that he must put on his jersey. Morphia, freely supplied in our valleys, is too sparingly used on the hills. Ten times as much should have been injected. The journey to the valley on one of Greene's stretchers should be no more than an unpleasant dream. To the wounded alcohol, the poison of the hills and the pleasure of the valleys, is given freely: morphia, the life saver, is given with timidity by the lay mountaineer.³ In severe head injuries alone should morphia be withheld and these usually have no pain. If the patient is warm and free from pain he will recover from shock and may be in better condition at the foot of the mountain or at the hospital than at the foot of the rock. This should be the aim of rescuers. It is for this reason that we shall have to furnish small depots of heat-producing and pain-reducing materials at the foot of our busiest rocks. Similar improvements along all the lines of retreat suggest themselves.

When the valley is reached the trials of the patient begin and the leader unfortunately too often thinks his task ended. He has, however, to consider the end of the chain and the weary weeks of recovery and perhaps suffering. He must resist, until he has made due enquiry, the advice of the local doctor and the sweet enticements of a bed in the local hospital. The damaged climber must have the best treatment at the best possible place at the earliest possible moment. Enquiry for advice from someone at a great hospital centre, preferably by the local doctor, should always be made in any serious injury. Again, with warmth and freedom from pain, produced by devices to

³ I would like to endorse the wisdom of this remark. Even nurses are unduly frightened of morphia.—R. G.

be kept in the valley and provided by the mountain rescue committee, long journeys could be made by ambulance after the patient has been suitably prepared by local medical nursing and other help.

All this will need a big expenditure of time and money.

MR. EUSTACE THOMAS.—In regard to the Duralumin stretcher, to which my name is attached, I can speak from knowledge and experience. Dr. Greene spoke of this as follows :

‘ Unfortunately lightness has been achieved at the expense of strength. It is a fragile apparatus, and it is unlikely that it would long survive the rough usage to which it would be submitted in time of war.’

It happens that stretchers of this design are the ones which have been used almost entirely throughout the English mountain centres, and in some of the Scottish ones. Mr. Pigott tells me that they must have been used close on a hundred times, and in all cases by inexperienced untrained people, and generally on particularly difficult climbing ground. In spite of this, the number of stretchers returned to me for repair has been surprisingly small over a number of years, so I think I am entitled to doubt Dr. Greene’s judgment as an engineer.⁴

Then too, in his list of desirable qualities, he has placed lightness first of all. I certainly doubt this. The average casualty would weigh 160 lb. With the stretcher rugs, etc., to keep him warm, the weight would come up to 200 lb. or over. The bearers would probably be quite unaffected whether it were 200 lb. or 190 lb., and refinements in carrying would count for a great deal more.

A very much fairer criticism of this stretcher would be the statement that it is too expensive, and some doubt perhaps whether the refinements provided are worth the extra cost.

In my own personal experience I have been specially struck by the way in which almost any kind of stretcher can be practically effective. In my first experience, a climber was very badly injured well away on the moors. We searched the neighbourhood, and brought back two signposts of timber, perhaps 4 in. square, and 8 or 9 ft. long, and two rough sticks. By skilful lashing, the two signposts were held apart by the two sticks and a bed was made by lacing a climbing rope, of which there was plenty, backwards and forwards from one stretcher longitudinal to the other. Under the very skilful and illuminating direction of a police surgeon who happened to be there at the time, the patient was carried in a practically level and horizontal position sideways down a very steep, very long and very rough, irregular and difficult

⁴ It is made clear in my paper that the Commando medical officers considered that the Thomas stretcher was insufficiently strong for *Army* use. The circumstances of modern warfare are very different from those of peace. Stretchers are often thrown into boats and from boats on to rocky shores. The Commando M.O.’s who examined the stretcher formed their opinion as doctors and soldiers, not as engineers.—R. G.

slope, and thereafter had to travel some miles before the road and an ambulance was reached. This Heath Robinson stretcher stood up to all the wriggling and working to which it was subjected right to the end. It must have weighed quite 60 lb.

My last experience was that described by Mr. Pigott, where the men were carried down by a stretcher improvised out of climbing line. This stretcher weighed probably about 4 lb. It was invaluable in that it brought the man down, but it was rather a painful operation for bearers and for the patient himself.

A further example was provided by the accident on Ben Nevis, described by Mr. Pigott. The casualty was at first handled on the police stretcher, and this was found very difficult. When the Duralumin stretcher arrived, the other was dumped on it, in spite of the added weight, and the refinements in carrying on the Duralumin stretcher were illuminating in providing extra speed and ease.

Thus, almost anything will do at a stretch, but in the case of bad injuries, the survival of the patient is more likely if there is some refinement which gives ease and speed in transport, and for this reason the cheapest and lightest stretcher is not necessarily advisable.⁵

Nothing was said by Dr. Raymond Greene as to the support of a patient when he has to be lowered down nearly vertical rocks. As Mr. Pigott stated, this case has arisen several times with the Duralumin stretcher. The arrangements⁶ used were adopted after the writer had experimented on himself by hanging on a nearly vertical stretcher with various methods of support. A number of these were found to be surprisingly painful after about ten minutes.

My final conclusion is that some of these refinements are very advisable, and the stretcher must be a general purpose affair. It is impossible to have a variety of stretchers, and if one had, one would not usually know which one was wanted. Among these, the refinement of telescopic handles in very difficult situations seems quite worth while, for in these cases the two bearers, one in front and one behind, must take the bulk of the responsibility of handling. Without telescopic handles it is very difficult for the back bearer to see where he is placing his feet, and this is particularly penalising on rough mountain ground.

MAJOR E. H. L. WIGRAM, R.A.M.C.—Having spent a certain amount of time, with mountain troops I will detail a few of my experiences and describe some of the special equipment with which we were provided. I must hasten to state at once that I have seen no active service in mountains and have been fortunate—or unfortunate,

⁵ Everyone must agree with Mr. Thomas that expense should not be considered. My experience suggests that lightness is important, but, as I say in my paper, it must not be achieved at the expense of strength. I might have added 'or convenience.'—R. G.

⁶ The arrangements are excellent and could be adapted for use with any stretcher.—R. G.

according to how you look at it—in having been involved in very few mountain rescues.

First of all, equipment. In discussing this I will confine myself to special military medical equipment without mentioning military mountain equipment or normal medical equipment which hardly come within the scope of this discussion. The stretcher finally adopted was the folding Airborne model with one or two slight modifications.⁷ This stretcher has the advantage of being comparatively light—under 20 lb.—and can be carried without discomfort, when folded, by one man over rough country. It will stand up to a fair amount of rough handling and can be slung through the air in rock rescue without any danger of it folding up. It can also be carried by pack animals, one stretcher on each side, by employing the Johnson carrier, a metal framework specially designed for this purpose. The Johnson carrier can also incidentally be used for casualties in the sitting position in the same way as the Cacolet of long standing military design.

It is not claimed that the Airborne type stretcher is necessarily the best type for mountain rescue, but it was the best available which could be produced in sufficient numbers for military purposes. It is not fitted with runners, so is of no use in snow rescue. The Manifold harness may be employed with this stretcher to hold the casualty securely, whatever position the stretcher may assume, and is particularly useful in rock rescue.

To protect casualties from the cold the Swedish casualty bags were employed. These bags can be opened out fully with zip fasteners for easy access, and the casualty can then be completely zipped up inside, the head included if so desired. Chemical hot packs which warm up quickly on adding a small quantity of water are far handier than the ordinary hot water bottle and remain hot for many hours.

The evacuation of a stretcher case over any mountain country is a matter of hard humping, as anyone who has tried it will know, and a large number of stretcher bearers will be highly desirable, if not essential, over even comparatively short distances. Down short steep stretches of hillside, on the other hand, if the casualty's injuries will permit it, a pick-a-back carry by one man may save a great deal of time. The Greene carrier was not unfortunately adopted by the mountain troops to which I was attached, so I had no opportunity to use it; but I did have occasion to carry a man pick-a-back about 500 feet down a steep hillside through thigh deep snow and Canadian bush, with fallen trees and all complete, last winter. I am quite satisfied that by so doing probably at least an hour in time was saved and the casualty, who had a severe knee injury, suffered no more discomfort than he would have done as a result of any other type of carry over the same country.

Cliff rescue work is of course a matter of rope engineering, and there are many variations, all more or less satisfactory. The method which

⁷ A number of modifications were suggested by the committee mentioned in my paper. It should be clear that my strictures referred to the original model tested at the School of Mountain Warfare.—R. G.

seemed to give greatest control over the stretcher and consequently greatest comfort to the casualty necessitated one of the rescuers lashing himself to the lower end of the stretcher and walking down the rock face backwards with his feet on the rock, his hands grasping the lower handles of the stretcher and his body more or less horizontal. As the stretcher was lowered from above the man could keep it clear of rocky projections and guide it down smoothly, keeping the lower end of the stretcher always three to four feet away from the rock face.

Where snow evacuation is involved, of the methods I have seen used, ski lashed together would appear to be the most satisfactory. Quite a good toboggan can be made out of a single pair of ski lashed in a V, the casualty sitting on the ski stick cross-pieces padded by ground sheet, sleeping bag, etc. Four ski lashed side by side make a better toboggan if two pairs of ski are available, but the V type is undoubtedly sufficient for minor injuries. A skier sprained his knee very badly near the top of Snow Dome in the Canadian Rockies last winter at a height of over 11,000 ft. He had to be brought down to the Columbia Icefield chalet at about 6000 ft., a drop of 5000 ft. and a horizontal distance of about eight miles. There were fortunately some very competent ski instructors with the party, and they brought him down on his own ski, lashed in a V, more quickly than the remainder of the party could follow. The Nansen sledge as issued to the Army appears to have few advantages over a ski sledge. It is heavy and clumsy and very readily becomes bogged down in soft snow. I have seen four casualties brought down a six mile trail, three on Nansen sledges and one on a four-ski sledge. The latter was undoubtedly easier to handle though the casualty required more careful insulation from below, being so much nearer the ground.

In general, mountain troops require to have a very high standard of first aid knowledge. Casualties will almost inevitably have to be treated in the first place by the victims' comrades and may have to be tended for a considerable time by them until they can be brought to medical aid or *vice versa*.

In a further communication Major Wigram adds :

Dr. Raymond Greene rightly condemns the Mark II stretcher for mountain work, but for ordinary military needs it has proved itself entirely satisfactory.⁸ Two men can easily handle the stretcher over flat and easy ground and four men can carry it for long distances over such country. It is simple in construction and thus suitable for mass production and will stand up to a considerable amount of knocking about.

Dr. Greene was unlucky in the type model of the Airborne stretcher which he had for experimental purposes. The stretchers as issued for mountain warfare have proved themselves adequately sturdy and

⁸ I agree that the Mark II is usable for ordinary military purposes, but why not have a stretcher which is good for all purposes?—R. G.

have stood up to rough handling very well.⁹ These stretchers can be carried on the Johnson carrier on mule back and are quite suitable for cliff work provided they are kept as far as possible clear of the rocks. This seems an exceedingly desirable point, whatever stretcher is employed in cliff rescue, as the bumping of the stretcher over rocks will be liable to cause the casualty considerable harm both mentally and physically. It should not, moreover, be difficult in most situations to keep the stretcher clear, if the method described by me previously is adopted, or alternately, on very steep rocks if a static rope is fixed and the stretcher run down it on karabiners.

It is, I believe, agreed that the Koller stretcher is the best available for mountain rescue, but I cannot speak of it from first hand knowledge. It was not accepted for military purposes, I understand, on account of production difficulties. The Airborne stretcher, on the other hand, was already in production and was easily modified for mountain requirements. It has proved itself adequate though possibly not ideal for the purpose and was, I think, the best choice under the circumstances that could have been made.

MR. D. G. DUFF, M.C., F.R.C.S., Member of First Aid Committee of Mountaineering Clubs.¹⁰—From time immemorial hill people have used the sledge principle in labour saving transport, for it is down to the valley bottoms that almost all loads are taken. Wounded too must always be brought downhill to places of comfort and resuscitation. To those who have experienced the use of the sledge stretcher, either as saving all the hard labour of carrying, or all the shock and apprehension for the casualty, it comes as a great surprise that the services have not yet provided a standard sledge stretcher.¹¹

In snow and ice conditions the necessity is obvious, but for grass and heather slopes, rock or scree, it is no less imperative.

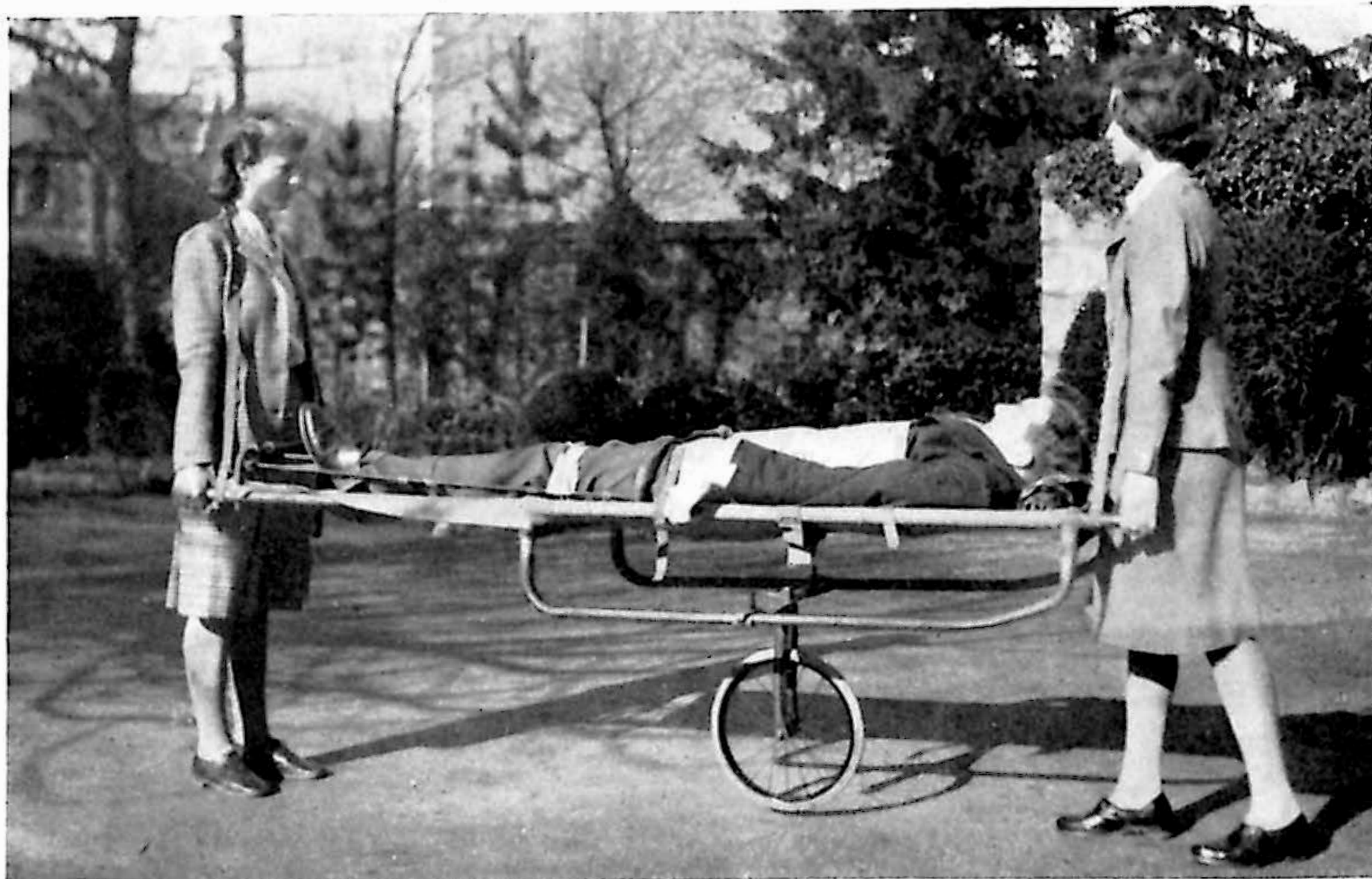
In trying to develop a cheap, strong, easily produced, collapsible, all-purpose sledge stretcher, I have made a number of widely different types and lately have concentrated on one of light tubular steel with easily removable canvas. This one in form and usage, folding, etc., is like the standard wooden stretcher but weighs less (26 lb.), and does much more.

It has sledge runners which need not be more than 3 ft. 6 in. long and which are shaped to fit ski when necessary for very soft snow. On ordinary snow slopes the slightly flattened steel tubes run better than the ordinary child's toboggan. The canvas top has a broad corselet with crutch straps to secure the patient firmly even in vertical positions, and a crossbar 3 in. high gives fixing for the Thomas splint,

⁹ It is clear from this and other communications that although our recommendation that the Koller should be adopted was not complied with, our suggestions for the Airborne did not fall on stony ground.—R. G.

¹⁰ We express our warm thanks to Mr. Duff for his kindness in sending this interesting statement.—EDITOR.

¹¹ See Duff, *Journal* of R.A.M.C., October 1939.



Photo, D. G. Duff.]

THE STRETCHER-BEARERS' SLINGS ARE USED TO DRAG THE STRETCHER AS A SLEDGE.



Photo, D. G. Duff.]

IN VERTICAL POSITIONS THE 10-IN-DEEP SLEDGE RUNNERS KEEP THE PATIENT CLEAR OF PROJECTIONS ON WHICH ORDINARY RUNNERS WOULD CATCH. NOTE POSITION OF WHEEL WHEN NOT IN USE.

that essential in shock prevention for fractured legs, so common in mountaineering casualties. During vertical descents on rock pitches this allows a broken leg to be lowered without any jarring whatever, and the crossbar gives a sense of security underfoot which the shocked patient needs.

A pocket of the canvas holds a cross strut ($3\frac{1}{2}$ lb.) which can be quickly fitted between the runners to provide a socket for a wheel (3 lb. weight, ordinarily carried under the patient's pillow) which will take all the lifting strain from bearers as they proceed over level ground or footpaths. Thus two men can carry a 16-stone patient with surprising ease and speed, and stretcher bearers liable to severe physical strain in their work of mercy can succour patients who otherwise would be left long, perhaps too long, wanting the admirable resources of modern surgery.

Ordinarily, stretcher bearing is incredibly hard work, but older Home Guard men here apparently enjoyed taking patients from difficult positions with the sledge wheel stretcher. It is carried in daily use by the local ambulance. A typical incident may be cited in the recent cold spell, when the ambulance could not use an icy hill road, but the patient with severely fractured thigh bone was very quickly slid down in complete comfort by a somewhat surprised police stretcher party who found it difficult even to walk.

A sledge wheel undercarriage of the same construction has been made which will fit standard wooden stretchers, for there is always reluctance to scrap existing equipment. This really only requires the addition of two poles, with canvas stretched between, to form a complete sledge stretcher, and if the wheel is fixed at one end of the runners it allows a wheelbarrow *modus operandi*: one man transporting another with less strain than either of the normal two bearers would have with the standard stretcher.

CAPT. E. L. FOTHERGILL, R.A.M.C.—I should like to defend the Neil Robertson stretcher; with the modifications I have devised in Cornwall and my 'escort' method for accompanying and steering it up and down the cliffs, I consider it quite admirable and the most comfortable stretcher I know.

I have proved over and over again the worth of two 'rope men' for taking most of the weight of a stretcher during its passage down or across steep and uneven ground. Two rope lengths are needed, twenty to thirty feet each in length; for descents these are attached to the upper end of the stretcher, for traverses, to its upper side. One man at the end of each rope can then take a large share of the weight and control the stretcher, while the bearers are enabled more easily to find their footholds and choose their route. A mistake often made is to have the ropes too short.

CAPTAIN A. D. SIDE, R.A.—I have been instructing in general mountaineering high up in the Lebanon for 15 months. The only

stretcher we had for use in extremely difficult country, often far from roads or tracks, was the Mark II, which was not satisfactory. When I became Chief Instructor in one of the Wings, I tried to tackle the problem. Later on we had some folding paratroop stretchers and I wished to have one altered. The Base Ordnance Depot were unusually helpful. They changed and altered as frequently as I wished and to some purpose.

The result was the stretcher with sledge runners, $\frac{1}{8}$ in. steel strips—the same as other parts of the stretcher—with welded supports, and continued past 'legs' to end of handles; special clips underneath to prevent the cross arms from collapsing as they otherwise do; tubular steel double extension handles; side loops for use of extra bearers and corner loops for use to lower stretcher cranewise if possible from belays and karabiners. Spare stretcher carrying slings were used as harness. The patient's legs go through two loops up to the thigh and these are fastened to the top of the stretcher. The other two loops go over the arms and shoulders and are fastened to the bottom of the stretcher. A blanket was wrapped completely around stretcher and patient and fastened with four large blanket pins; then the loose edges were folded over and fastened with a further four pins. The patient could be revolved head over heels or sideways without falling off the stretcher. It all worked well so far on nasty waterworn limestone for the additional weight of 12 lb. It still folded as originally and was kept packed on a Yukon board with its blankets, harness, pins, extra rope and adjustable ropes and ring for 'craning' the stretcher up or down. This was found satisfactory even for moderate climbing.

The protection of the patient was not satisfactorily dealt with before our Wing was dispersed. I tried four pieces of fibre board—two layers, each going the length and breadth of the stretcher with a gap of about 2 in. between. The idea was to keep the load one that could be loaded on a Yukon. As a unit improvisation it worked while the alternative did not.

I do not wholly agree with Dr. Greene's condemnation of the Everest and Yukon for material loads.¹ I did not try to carry casualties on them. At Mountaineer Wing we taught the theory and practice in man-packing. Suitable and unsuitable loads were placed on both Everest and Yukon and all types were carried by each student on various courses. A record of students' opinions was kept. We decided that if these carriers must be used, the Everest was suitable for compact loads up to 45 lb. and unsuitable for large bulky loads or loads which must be carried vertically. The Yukon was suitable for loads between 50–80 lb. and for awkward bulky loads such as an 8-man tent. Manufacture and design of both is not satisfactory. A modified form of Yukon is the Laglong carrier, designed and tested by our own instructors over several months, and also used with great success in action. Basic principles: weight carried on broad felt shoulder straps; back straps which permit some of the weight to be

¹ I did not criticise the Yukon for loads. It is excellent.—R. G.

taken on the sacrum and a stomach band which transfers some direct to the pelvis. An ingenious system allows for all round adjustment. Weights of 130 lb. have been regularly carried up 2000 ft. in about 1 hr. 30 min. without undue discomfort. I should think this could be used for casualties, but this was not tried.

ONE MAN LIFTING AND LOWERING

This is a method enabling one man to lower or raise a casualty on a rock face using only a climbing rope, rope waist loops and karabiner(s)—the usual equipment of most climbers. A doctor or a non-climber might be similarly lowered or raised. For this method the casualty (C) must be able to use one arm or one leg to fend himself off jutting rocks.

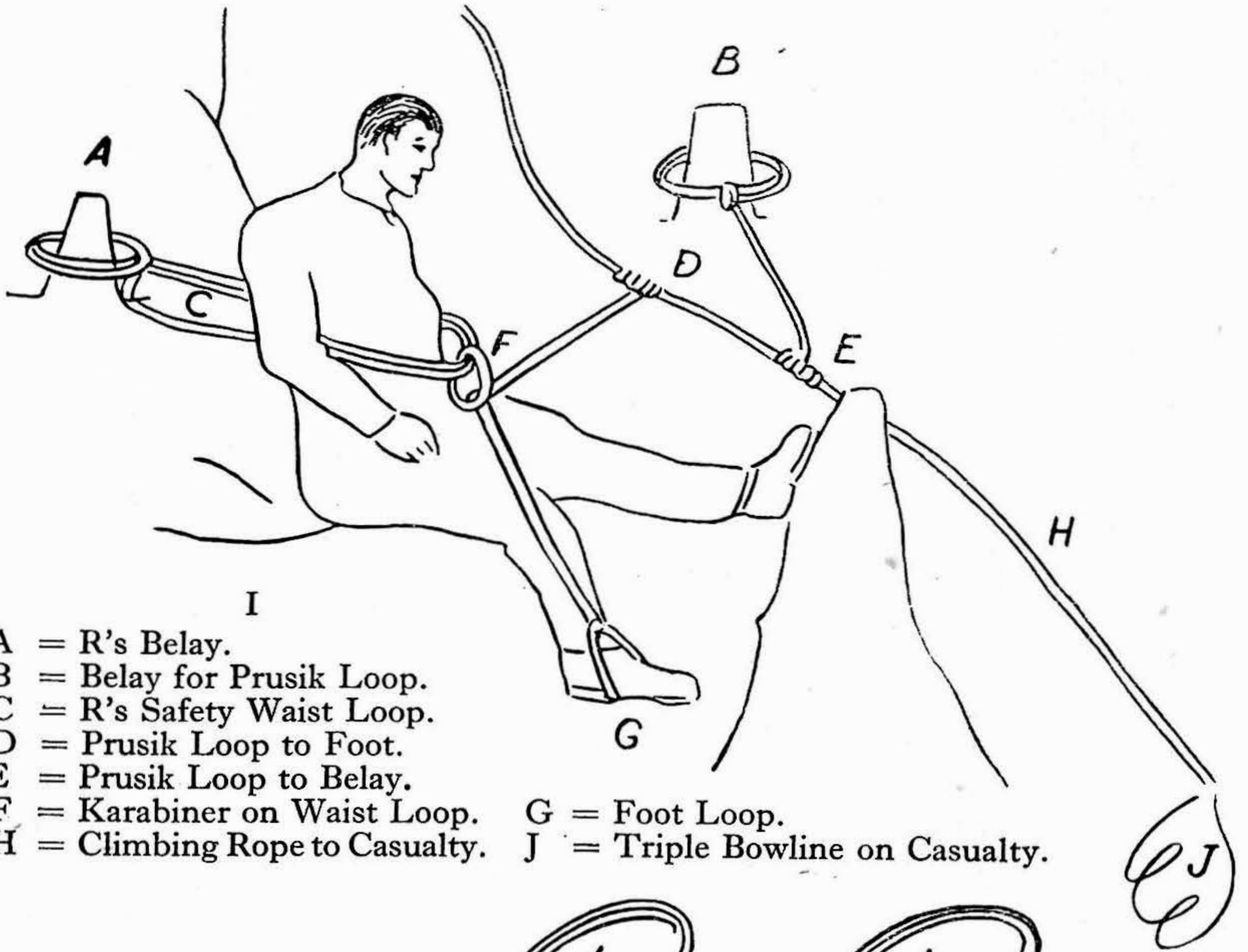
The system is based on the use of two Prusik loops which slide along the climbing rope attached to the casualty. Choose a place where the climbing rope and Prusik loops will not rub on the rocks; otherwise pad to prevent damage to ropes. The best position for the man (R) dealing with C is for him to sit directly above C. He may also stand; footrests help in each case. R should have a rope twice around his waist and around a belay behind him so that he is quite secure. There should be no slackness in this waist belay; it must be adjusted to give the most comfortable and effective working position. R's belay should be directly behind him in line of pull. He should be able to get in and out of his waist loop belay in case of need or move it if it is tied to him (not so good).

C should be secured in a triple bowline if he can be reached, otherwise by whatever method the circumstances demand.

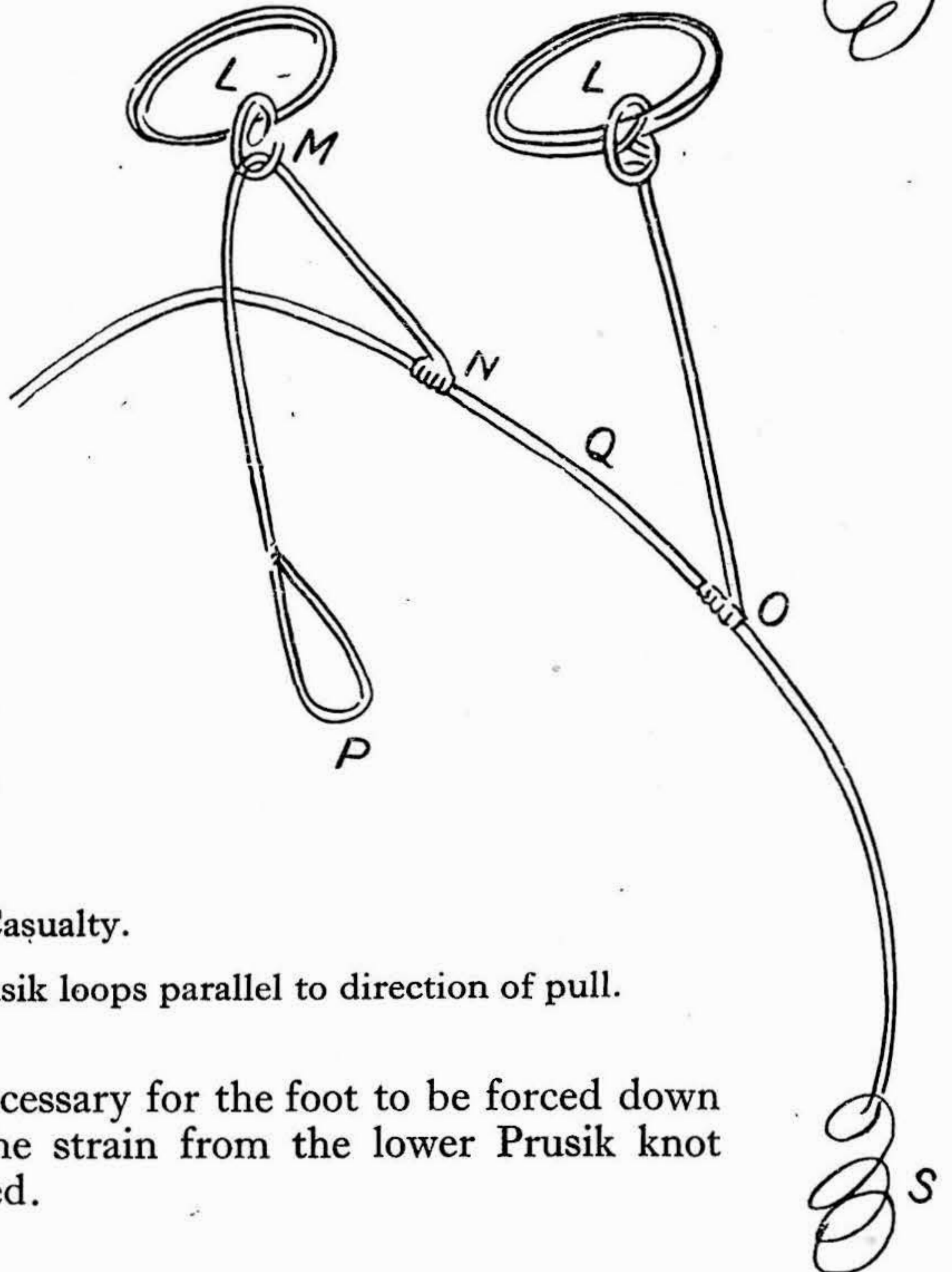
The climbing rope passes to one side of R and a Prusik loop (made of line) is placed on it within reach of R, but as far down the climbing rope as he can conveniently reach. This loop has its own belay for security and should be as near as possible in the line of pull.

A second Prusik loop (line) is placed above the first (i.e. nearer to R) and passes through a karabiner (to cut down friction) attached to the front of the ropes passing around R's waist. The karabiner and upper Prusik knot should be as near R's stomach as possible. This Prusik loop has a further loop at its end to take R's foot. The whole is of such a length that about 9 in. before R's foot is fully extended the top Prusik is under tension. When the leg is fully extended the Prusik knot should come to within 1 in. of karabiner. The two Prusik knots should not be at any time nearer than 1 ft. to each other.

Now, by alternately taking the strain on each Prusik loop C may be lowered or raised 6 in. to 1 ft. on each transfer. The power of the leg acting via the foot loop and the Prusik knot is easily able to move the weight of C. R's hands are quite free and he is able to adjust the position of the Prusik knots on the climbing rope in conjunction with his leg movements. Each Prusik knot therefore alternately takes the strain, and should one slip the other comes into play giving security. The adjustments during use can be continuous and rapid with very



- A = R's Belay.
- B = Belay for Prusik Loop.
- C = R's Safety Waist Loop.
- D = Prusik Loop to Foot.
- E = Prusik Loop to Belay.
- F = Karabiner on Waist Loop.
- G = Foot Loop.
- H = Climbing Rope to Casualty.
- J = Triple Bowline on Casualty.



II. Alternative Method.

- L = Loops round Belay.
- M = Karabiner.
- N = Prusik Loop to Foot.
- O = Prusik to Belay.
- P = Foot Loop.
- Q = Climbing Rope.
- S = Triple Bowline to Casualty.

Try to get 2 Prusik loops parallel to direction of pull.

little practice. It is necessary for the foot to be forced down only $\frac{1}{2}$ in. to release the strain from the lower Prusik knot and allow it to be moved.