Fracture Care at the Front in WWI

The Bottom Line.
Mortality from long bone fractures of the leg was 80% before the use of traction splints. While the traction splint was invented in the 1870s, the First World War was its proving ground, and mortality plummeted to 8%. For more, read on.

The Details.
Long bone fractures were a common problem in WWI. Most were due to gunshot wounds and the rest were caused by shrapnel or falls. German machine gunners set their guns at leg height so that as men fell from leg wounds, their abdomen, chest, and then head would pass through the stream of bullets, more seriously wounding or killing them.

Gunshot Wound to:	Frequency per 1000 battle injuries
Shoulder with Fracture	5
Upper Arm with Humeral Fracture	75
Elbow	50
Forearm, Wrist, or Hand with fracture	200
Spine	10
Hip	10
Femur (thigh bone)	75
Knee Joint	25
Lower leg	100
Foot and Ankle	120

Navy corpsmen did not carry cumbersome splints onto the field. When they treated a fracture victim, corpsmen gave the casualty an intramuscular injection of morphine. They carried pre-filled syringes with 15 milligrams of morphine, known as Greely Units. After the morphine took hold, they splinted the extremity to whatever was available. They used sticks or tree limbs when they worked in woodland areas. Corpsmen didn't have tape, but used gauze or fabric rolls to secure the fractured limb. In open fields the corpsmen splinted one leg to the other (if the opposite leg was not also broken). If both legs were broken, the corpsman would often use the trooper's rifle as a splint.

Some men with lower arm fractures could still walk. After supporting the arm in a sling, the casualty would try to make his way back to an aid station on foot. The more severe arm fractures were too painful and unstable to allow the man to walk. These cases required splinting, morphine, and stretcher evacuation.

Stretcher evacuation could take many hours, during which time the casualty was at risk of additional injury, hypothermia, shock, or dehydration. Evacuation by foot or stretcher caused bone fragments to shift leading to increased tension or spasm in nearby muscles leading to muscle, nerve, and vascular damage. The nerve damage not only caused great pain, but could lead to permanent weakness, paralysis, chronic pain, or other sensory impairment. Vascular damage led to hemorrhage and increased risk of deep venous thrombosis. If the fracture was associated with an open wound, the motion drove contaminants deeper into the wound.

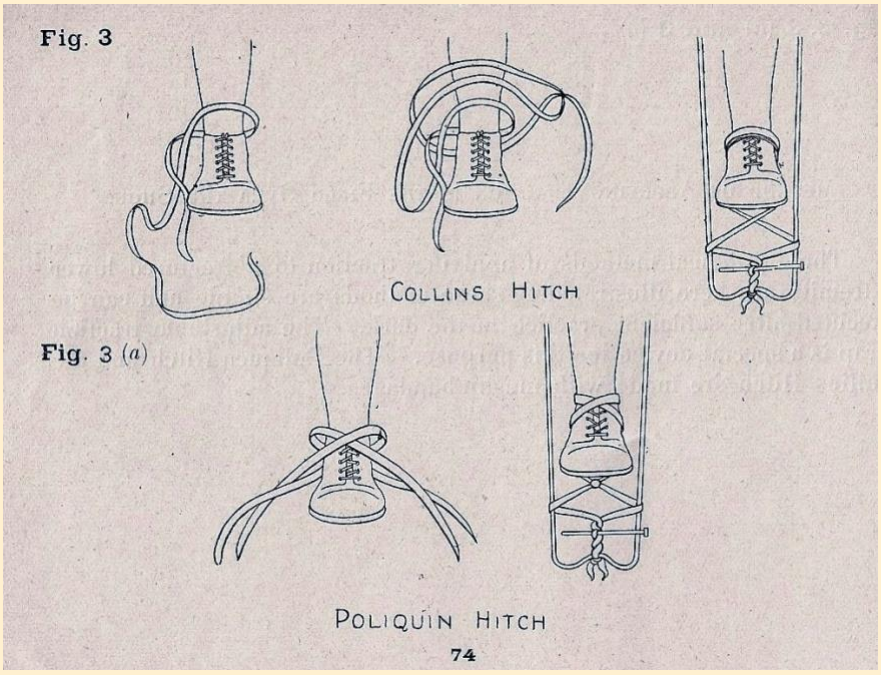
Long bone fracture patients were evacuated to the battalion aid station rather than the company aid station if at all possible. The exact splint placed depended on the nature and location of the fracture and what splints were available at the time. Shortages were common during active combat operations, and artillery bombardment made resupply hazardous and difficult.

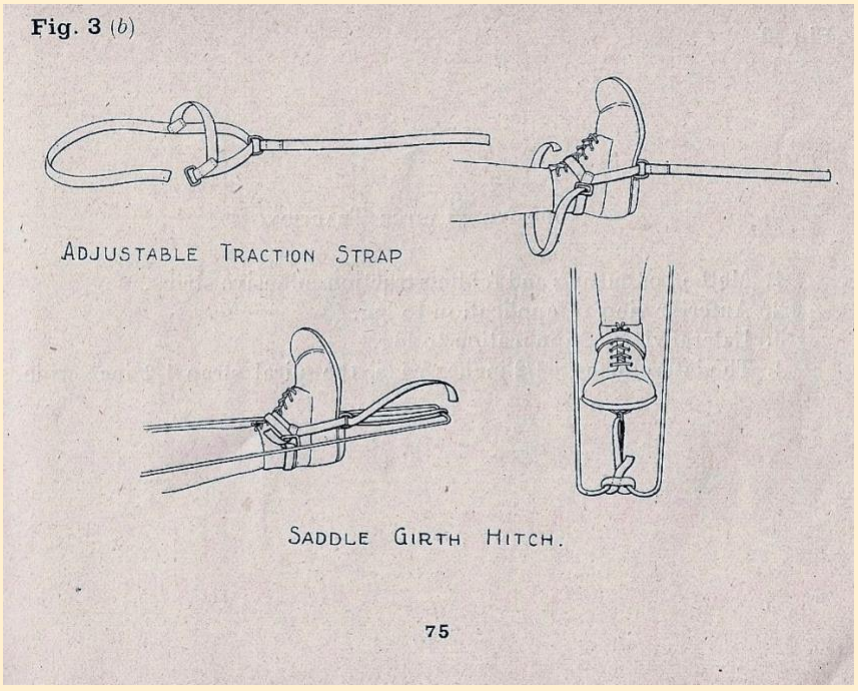
Relatively simple splints would suffice on wrist, forearm, hand, ankle, and foot fractures. Fractures of the upper arm (humerus), hip, thigh (femur), and lower leg (tibia) required traction splints. Traction splints for the humerus were cumbersome and difficult to use during stretcher transport. These could be applied at the battalion aid station, but were often delayed until the patient reached a field hospital. The hip, femur, and tibia, on the other hand, needed splinting at the earliest possible opportunity.

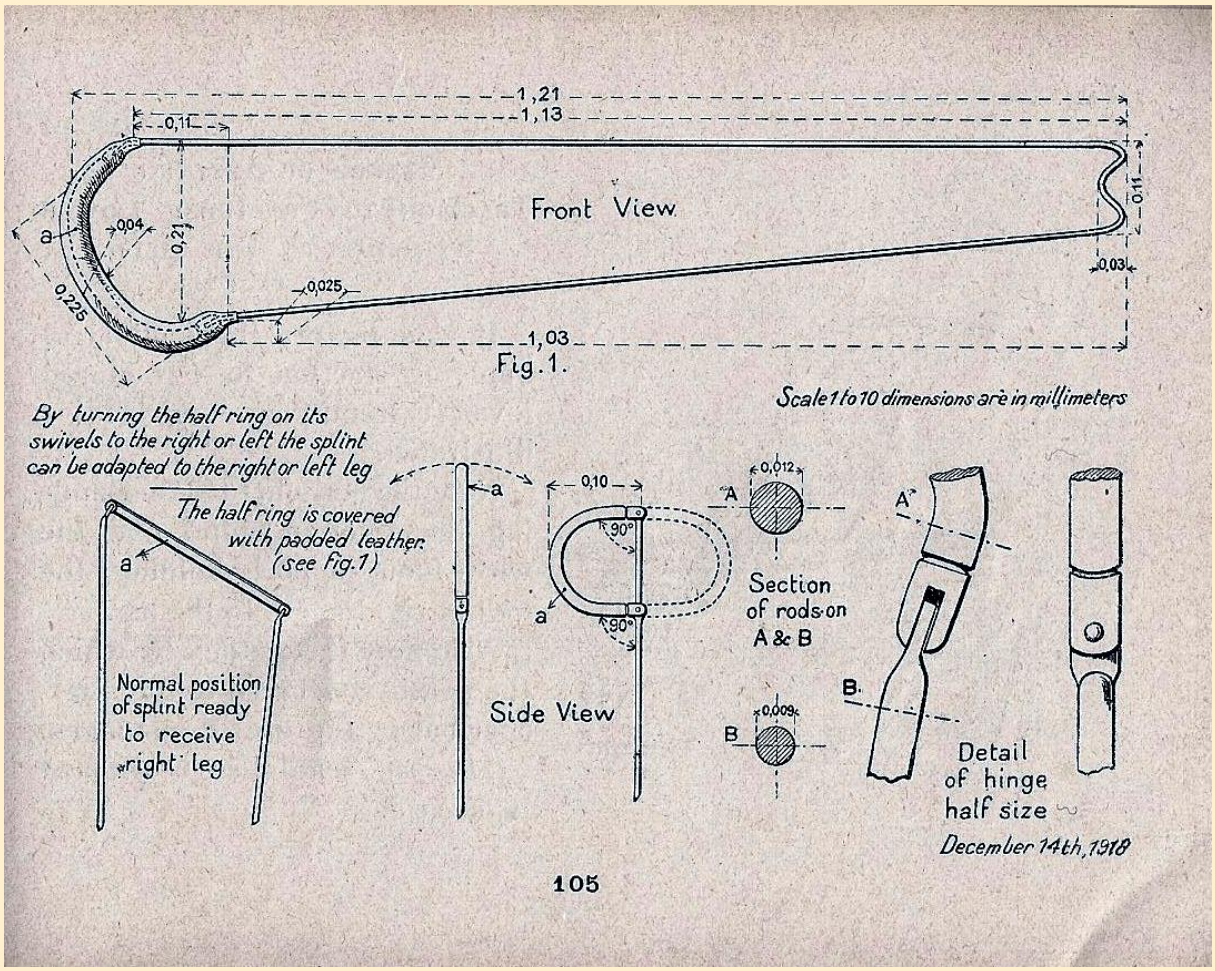
The Thomas splint was one of the major innovations of WWI medicine. It was the first developed by a Welsh surgeon, Hugh Thomas in 1875. According to the source below, he offered it to the French to use during the Franco-Prussian War, but it was rejected and remained relatively unknown until Thomas's nephew and one-time apprentice, Sir Robert Jones brought the device to the British and French armies in 1915. It reduced the mortality of femur fractures from 80% down to 8%.

After a casualty was evacuated to a point where the Thomas leg splint could be applied, the man's boot was left on and the traction portion of the device was secured to the boot by a variety of methods. The following drawings were copied from the Red Cross

Manual referenced at the end.







Mechanical Drawing of Hinged Half-Ring Thigh and Leg Splint

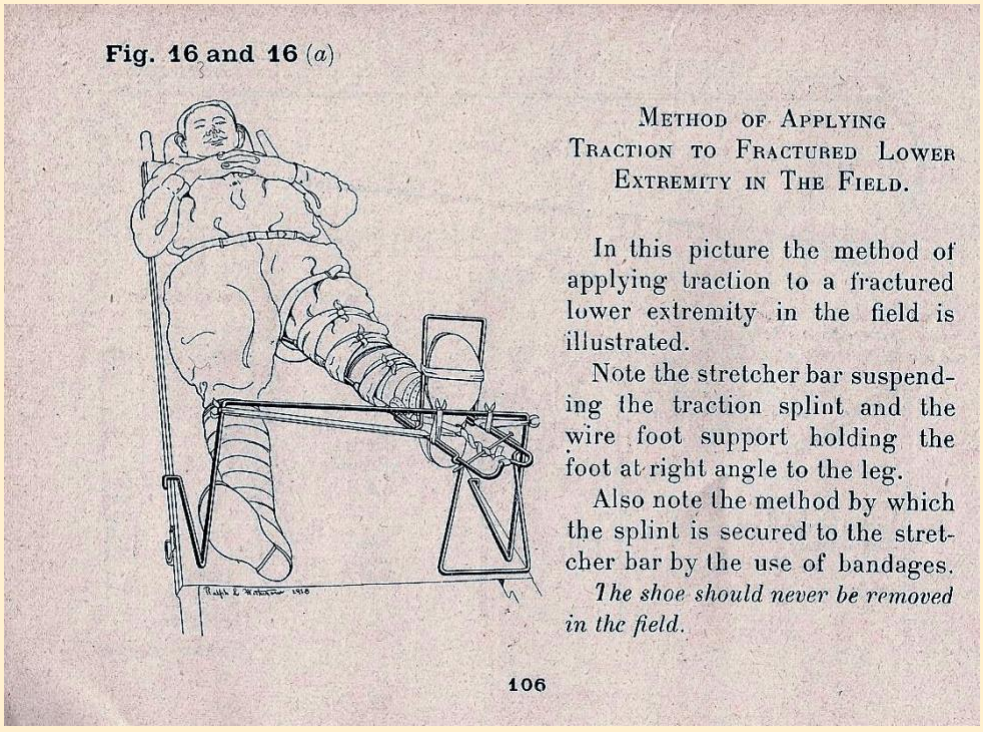


Fig. 16 and 16 (*a*)

METHOD OF APPLYING TRACTION TO FRACTURED LOWER EXTREMITY IN THE FIELD.

In this picture the method of applying traction to a fractured lower extremity in the field is illustrated.

Note the stretcher bar suspending the traction splint and the wire foot support holding the foot at right angle to the leg.

Also note the method by which the splint is secured to the stretcher bar by the use of bandages.

The shoe should never be removed in the field.

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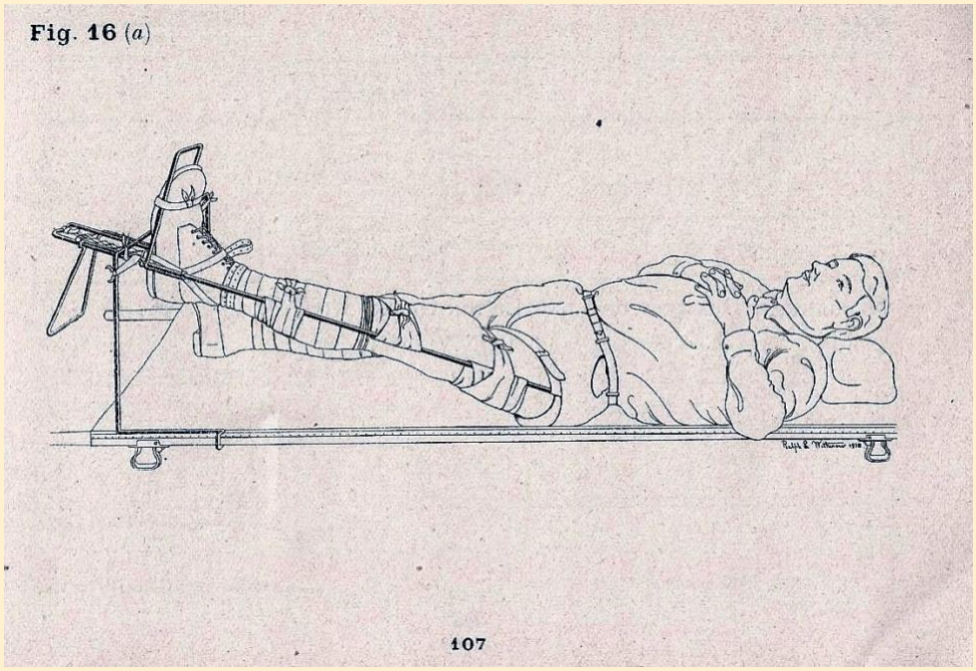

Fig. 16 (*a*)

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The Thomas Leg Splint, applied.

Pelvic and hip fractures required stabilization using the Long Liston Splint. These were used for transport, and were applied at either the ambulance dressing station or the field hospital; they were not allocated to battalion or regimental aid stations. These are shown below:

Fig. 18 and 18 (*a*)

LONG LISTON SPLINT WITH INTERRUPTING BRIDGE.

Applied for stretcher transport *only*.

Uses : —

(*a*) Injuries of the pelvis requiring fixation in transport.
(*b*) Injuries of hip joint requiring fixation and abducted position in transport.

The upper thigh and hip should be supported in transport by a sandbag or pillow or spica bandage.

Note : — Thoracic and leg bandages.
Bandage passing from thoracic bar over shoulder.

Additional slings for support of leg or thigh may be added as desired, and if the bones are much comminuted a piece of wire ladder splint material applied to the back of the leg and thigh under the slings, furnishes more complete support.

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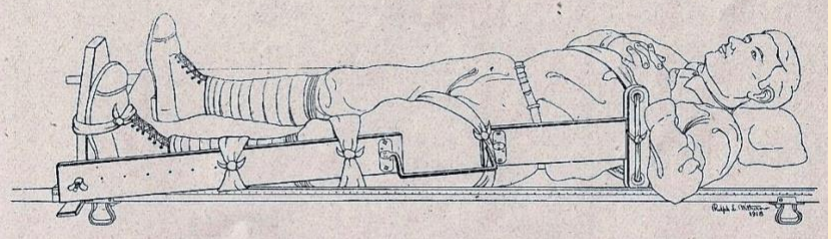
Fig. 18



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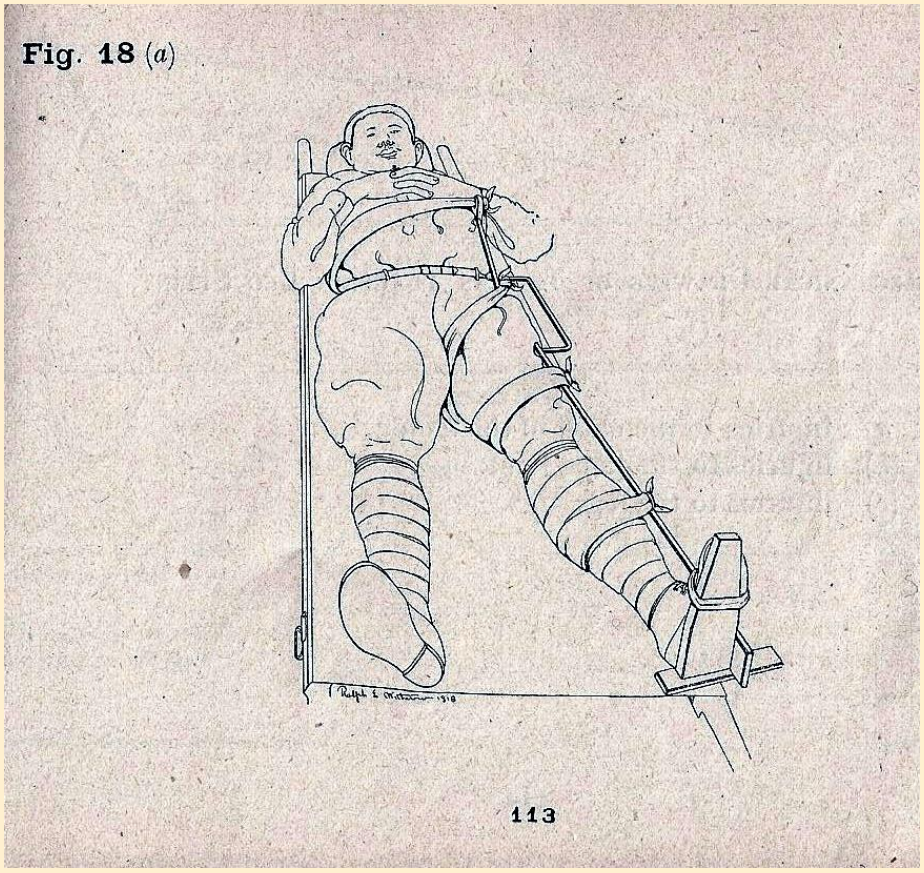
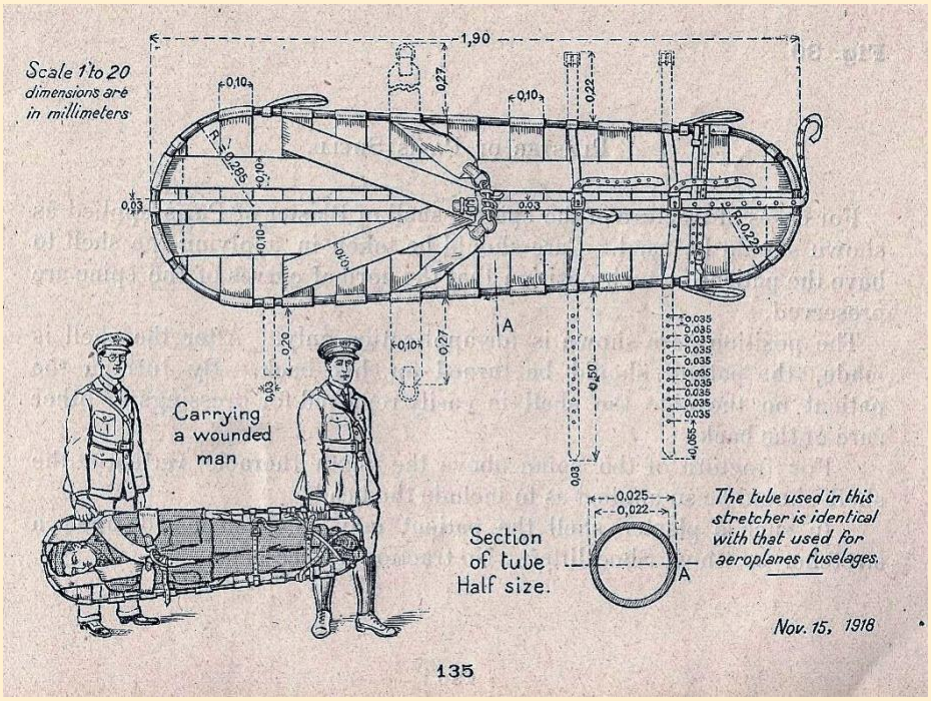


Liston Splint, applied.



Spinal and pelvic fractures were evacuated using the Snow Shoe Litter, shown above. Two of these were allocated to each ambulance company and each field hospital. They were useful in evacuation from the field, but were not kept with the battalion or company aid stations so their application was probably delayed until the casualty reached the ambulance dressing station.

Sources:
Manual of Splints and Appliances for the Use of the Medical Department of the United States Army, Second Edition, printed by The American Red Cross, 1918; published by Masson et Cie, Éditeurs, Libraires de l'Académie de Médecine, 120 Boulevard St. Germain, Paris.
http://www.wildernessemergencycare.com/book/splint_femurs.htm