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D. AHL.

PROCESS OF MANUFACTURING FELTED SURGEONS' SPLINTS.

No. 194,800. Patented Sept. 4, 1877.

Fig. 1.

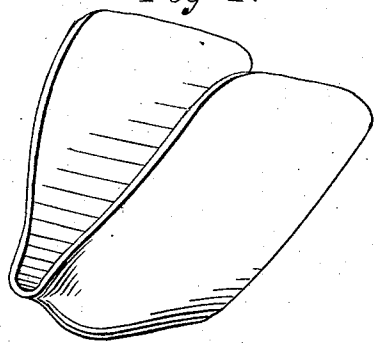


Fig. 11.

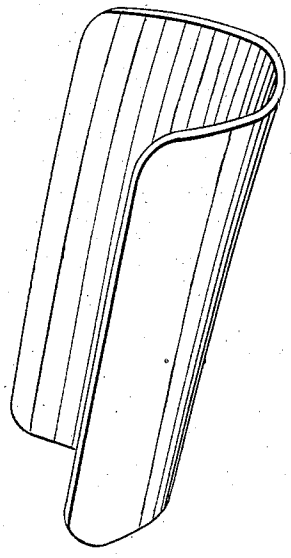


Fig. 8

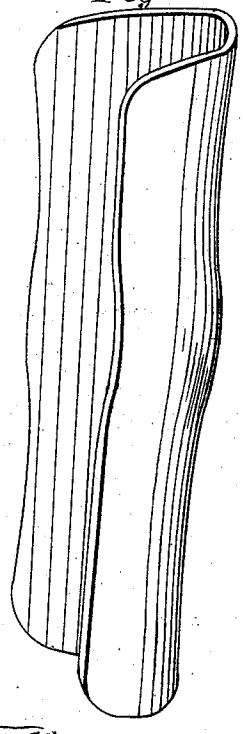
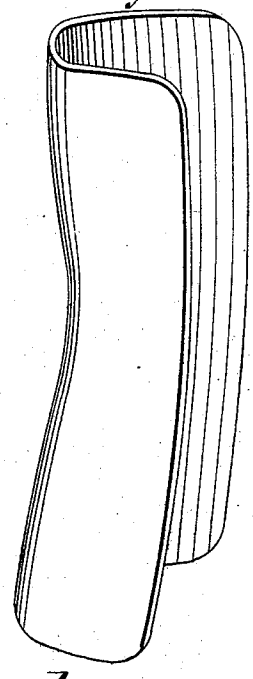


Fig. 9.



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PROCESS OF MANUFACTURING FELTED SURGEONS' SPLINTS.

No. 194,800. Patented Sept. 4, 1877.

Fig. 5.

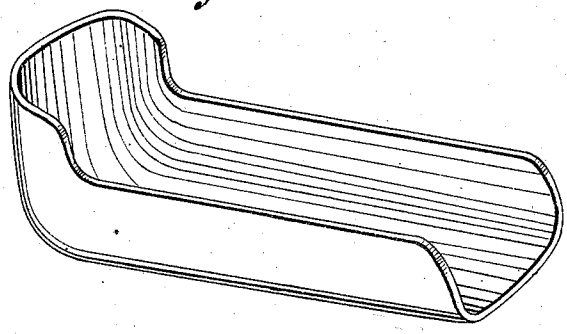


Fig. 4.

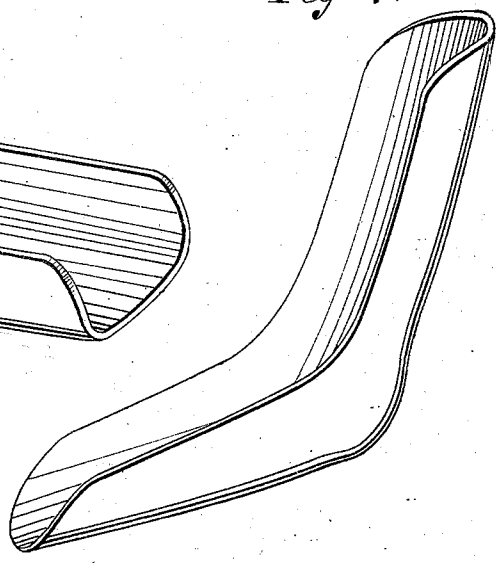


Fig. 2.

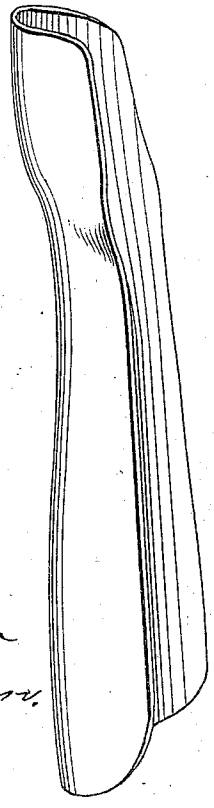
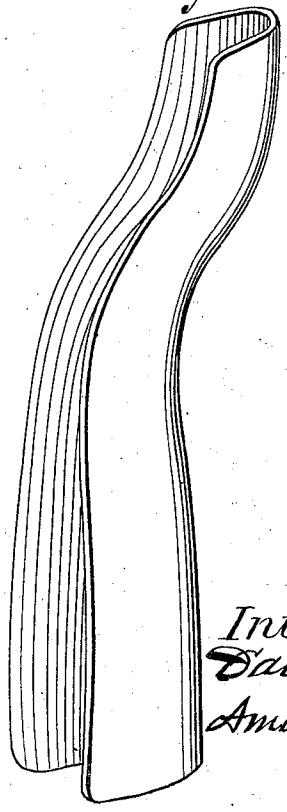


Fig. 3.



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PROCESS OF MANUFACTURING FELTED SURGEONS' SPLINTS.

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Fig. 7.

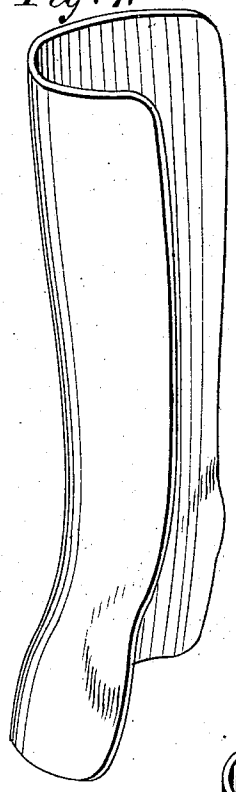


Fig. 6.

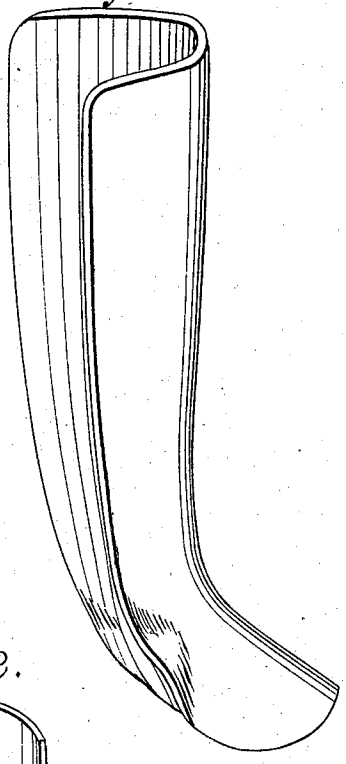


Fig. 12.

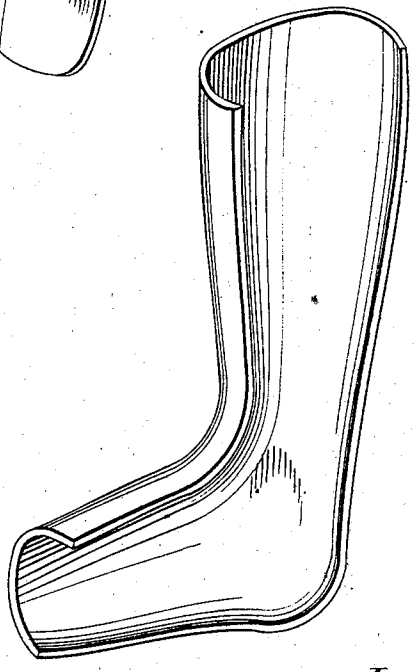
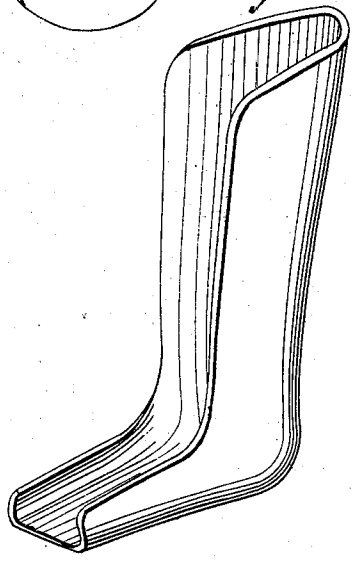


Fig. 10.



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UNITED STATES PATENT OFFICE.

DAVID AHL, OF NEWVILLE, PENNSYLVANIA.

IMPROVEMENT IN THE PROCESSES OF MANUFACTURING FELTED SURGEONS' SPLINTS.

Specification forming part of Letters Patent No. **194,800**, dated September 4, 1877; application filed June 28, 1877.

To all whom it may concern:

Be it known that I, Dr. DAVID AHL, of Newville, in the county of Cumberland and State of Pennsylvania, have invented certain new and useful Improvements in the Process of Manufacturing Felted Splints, to be used by surgeons in the treatment of fractured, enlarged, or dislocated joints or limbs, or deformed joints or limbs, or in the treatment of varicose veins, or indeed any disease where a surgical splint may be desirable in the treatment of men or animals; and I hereby declare the following to be such a full, clear, and exact description of my said invention as will enable any one skilled in the art of surgery to make and use it, reference being had to the accompanying drawings, making a part of this specification, said drawings being necessary to a proper understanding of the invention or its use, and to the manner of making and applying it.

The object of this invention is to produce and have ready for use artificial fibrous splints, duly formed, in the proper shape to suit the fractured or injured part of the average size and form of limb or joint, for the use of surgeons in treating fractured, dislocated, enlarged, or deformed limbs or joints, or varicose veins, which shall be plastic when hot, flexible and elastic when cold, thoroughly porous, to admit of the necessary respiration, and at the same time possess the necessary stiffness to properly support the fractured limb or joint under treatment.

The invention consists of surgeons' splints, ready for use, composed of felted cloth treated as follows: First, the cloth is cut in the desired shape and size to make the different size and form of splints. It is then saturated with a solution composed of shellac and alcohol. It is then dried and perforated with pointed needles, the perforation being made with pointed needles to prevent the fabric from being cut in perforating it. The fabric is then put in a bath of sulphuric acid and water, strong enough to set and harden the shellac, by which it is slightly contracted, and the perforations made by the needles slightly enlarged, thus making the cloth more porous. The blank of the unformed splint is then washed in clean water, after which it is immersed in water made boiling hot, by which it is made plastic, and, while in this condition, it is pressed or worked into the shape of the joint or limb to which it is to be applied, by means of forms or molds made to correspond in form and size to the several parts of the various limbs or joints liable to be treated, a separate splint being made for the different parts of the various limbs or joints, and also a separate mold or form for each size and form of splint.

In making the splints to be used for the treatment of an adult, the sizes of the various molds and splints are made to correspond to the sizes and forms of the limbs and joints of a man of the average size, taking into account the swelling due to the inflammation of the fractured or injured part, by which the several splints composing a set for an adult can be applied to men of different sizes, for the splint, being made plastic by dipping it into boiling water, can be enlarged or contracted enough in its application, and modified enough in its form, to suit limbs and joints of different men not differing too much in size and shape. The difference in the size and shape of the limbs of men of ordinary size not being so great but that splints of average size can be adapted to most of them on account of the plastic nature of the splint when hot and its flexibility when cold.

The solution of shellac and alcohol with which the blank splints are to be saturated should consist of about one gallon of alcohol to four pounds of shellac, and the fabric should be kept in the solution until it is thoroughly saturated. It should then be taken out and dried, and afterward perforated by means of a board fitted with a series of pointed needles.

The bath of sulphuric acid and water in which it is to be immersed, after being perforated, should consist of about one pound of the acid to about thirty gallons of water. The proportions of these solutions may, of course, be somewhat varied, and different gums, alkalies, and acids may be used; but the above-mentioned give good results, though I do not mean to confine myself to these particular ingredients or proportions, for there are other

ingredients, which are well known, that can be used or substituted. Any known gum solution, in alcohol or alkali, or any known acid-bath that will produce the desired result, will come within the scope of my invention.

In the drawings are shown some of the principal splints, the number and form of which, however, may be increased and changed to suit the exigency of the surgeon. For example, Figure 1 represents the lower maxillary splint. It embraces the entire chin, and forms a complete support to the fractured part, while at the same time it allows by its flexibility sufficient motion to open the mouth slightly to take food and drink. It should be retained by what is known as "Barton's bandage."

Fig. 2 represents the inferior fore-arm splint for the ulna, and Fig. 3 the superior fore-arm splint for the radius. These two splints are intended for all fractures of the fore-arm, and also for sprains and dislocations at the wrist-joint, complicated or not with fracture. Very often actual fractures of the head of the radius or ulna are diagnosed as sprains, and result in semi-anchylosis. These cases, even when of several months' duration, can be treated with complete success with these splints. They are also well adapted to treating Barton's fracture, requiring no pads or compresses, and being less likely to be followed by stiffness of the joint. They may be used either in combination or alone. As the radius and ulna are more liable to fracture than any other bones, ready-made splints are very convenient.

Fig. 4 represents the elbow-splint. It is for fractures and dislocations of the radius, ulna, and humerus at or near the elbow-joint. In combination with the inferior and superior fore-arm splints, it is adapted to all fractures of the ulna and radius, at the middle or upper third, or compound comminuted fractures of the same bones. Where both radius and ulna are fractured, bring the parts into contact, then apply the splints shown by Figs. 2, 3, and 4, and bandage over all, from the hand to the shoulder. If the fracture is comminuted, cut the part or parts out of the splints corresponding to the points of comminution, and bandage around them. The wounds can easily be dressed without disturbing the splints or bandages. As the swelling is reduced, tighten the bandages, as the splints accommodate themselves to the reduction. The elbow-splint is at an obtuse angle, to prevent the lapping of the soft parts, and as being most natural to sling.

Fig. 5 represents the shoulder-splint. Any fracture of the humerus can be successfully treated by a combination of the shoulder and elbow splints. The shoulder-splint fits over the exterior face of the shoulder, and is to be used with a short slightly-curved piece, to be applied to the opposite surface.

Fig. 6 represents the anterior tibia splint. It is intended for fractures of the tibia proper, and especially for fractures, either simple or compound, in the vicinity of the ankle-joint. It reaches from the knee-joint to the instep, and embraces the ankle-joint perfectly. Fractures of the malleoli will be readily treated by the combination of this and the following pieces. There are two splints of this kind to each set.

Fig. 7 represents the posterior fibula splint. It is suited to treating fractures of the fibula proper, and also in the vicinity of the ankle-joints, either simple, compound, or comminuted. Figs. 6 and 7 are combined for a complete apparatus for treating bad compound fractures of the tibia and fibula, either of the upper, middle, or lower third, and at the ankle-joints. There are two splints to each set, one for the left and one for the right limb.

Fig. 8 represents the anterior knee-joint splint. It is adapted to treat fractures of tibia, fibula, and femur near the joint, and also, in connection with the anterior and posterior tibia and fibula splints, to treat all fractures of those bones. There are two splints to each set, one for the right and one for the left knee-joint.

Fig. 9 represents the posterior knee-joint splint. This splint, in connection with the anterior knee-joint splint, treats fractures of the tibia, fibula, and femur, near the knee-joint, and also the upper third of the fibula and tibia, and the lower third of the femur, and also, in connection with the anterior and posterior tibia splints, treats all fractures of those bones. There are two splints to each set, one for the right and one for the left limb. These splints can be used for the tibia and fibula also, when fractured above the middle of the shaft. Figs. 8 and 9 are used also for fracture of the patella, and are well adapted to keep it in position.

Fig. 10 represents a club-foot splint for children. It is intended to treat the foot either before or after operation, which it does very successfully.

Fig. 11 represents a splint intended to treat fractures of the femur, and, with the anterior knee-joint splint and posterior knee-joint splint, to treat fracture of the lower third of the femur, and fractures implicating the knee-joint and hip-joint. It will also treat fractures of the shaft of the tibia and fibula.

Fig. 12 represents a lateral half-boot splint for treating fractures of the tibia or fibula laterally, and where the fracture is comminuted laterally, and where the ankle-joint is fractured, comminuted, or dislocated.

It will, of course, be understood that the size of the splints must be varied for children, and very large or very small adults. Those shown are intended for men of ordinary size.

Having now described the nature and object of my invention, I claim and desire

to secure by Letters Patent of the United States—

The process of manufacturing felted surgeons' splints, consisting of the following treatment, viz., first treating the felted blank in a solution of shellac and alcohol, then drying and puncturing it, then treating it in an acid-bath, then washing it in cold water, then softening it in a bath of boiling water, and molding it in the desired form.

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