

Nov. 6, 1923.

1,473,041

A. E. HENDERSON

TOURNIQUET

Original Filed July 12, 1920

2 Sheets-Sheet 1

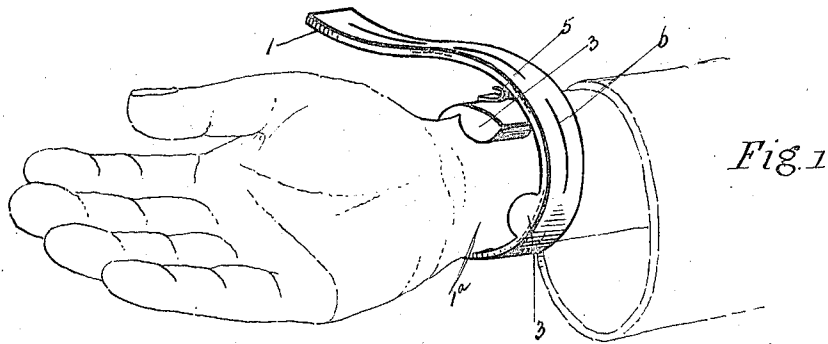
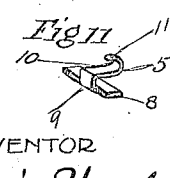
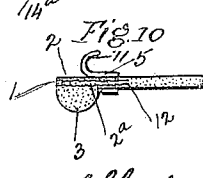
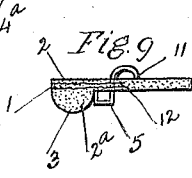
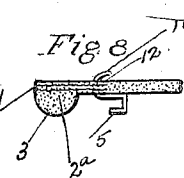
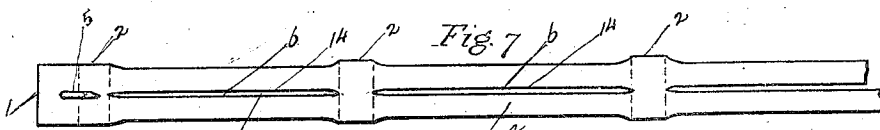
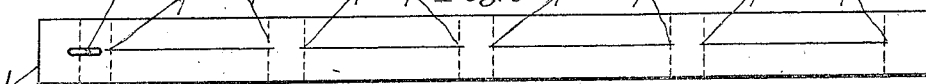
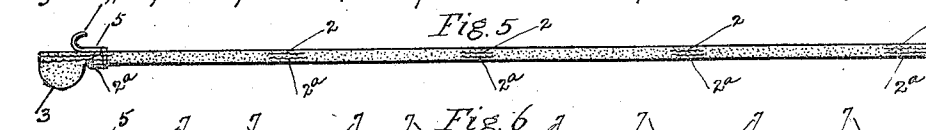
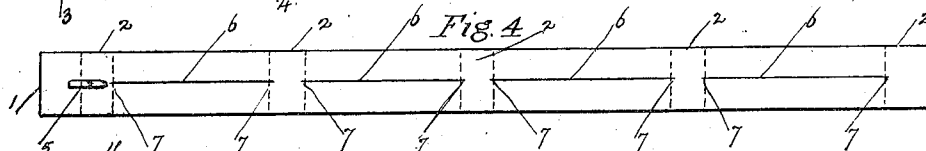
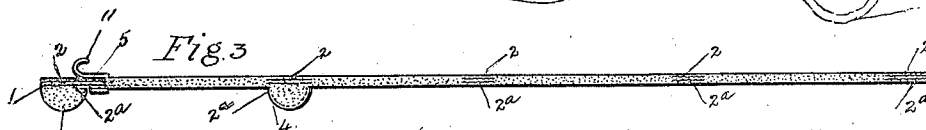
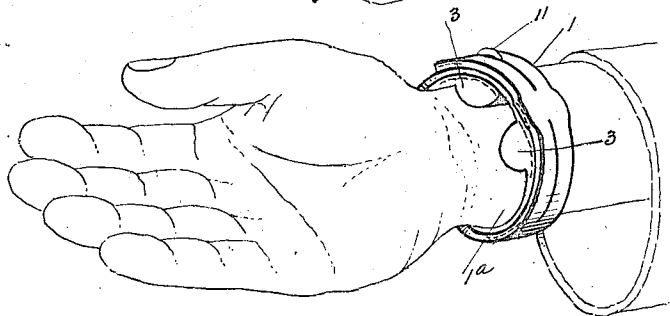


Fig. 2



INVENTOR

Albert Ennis Henderson

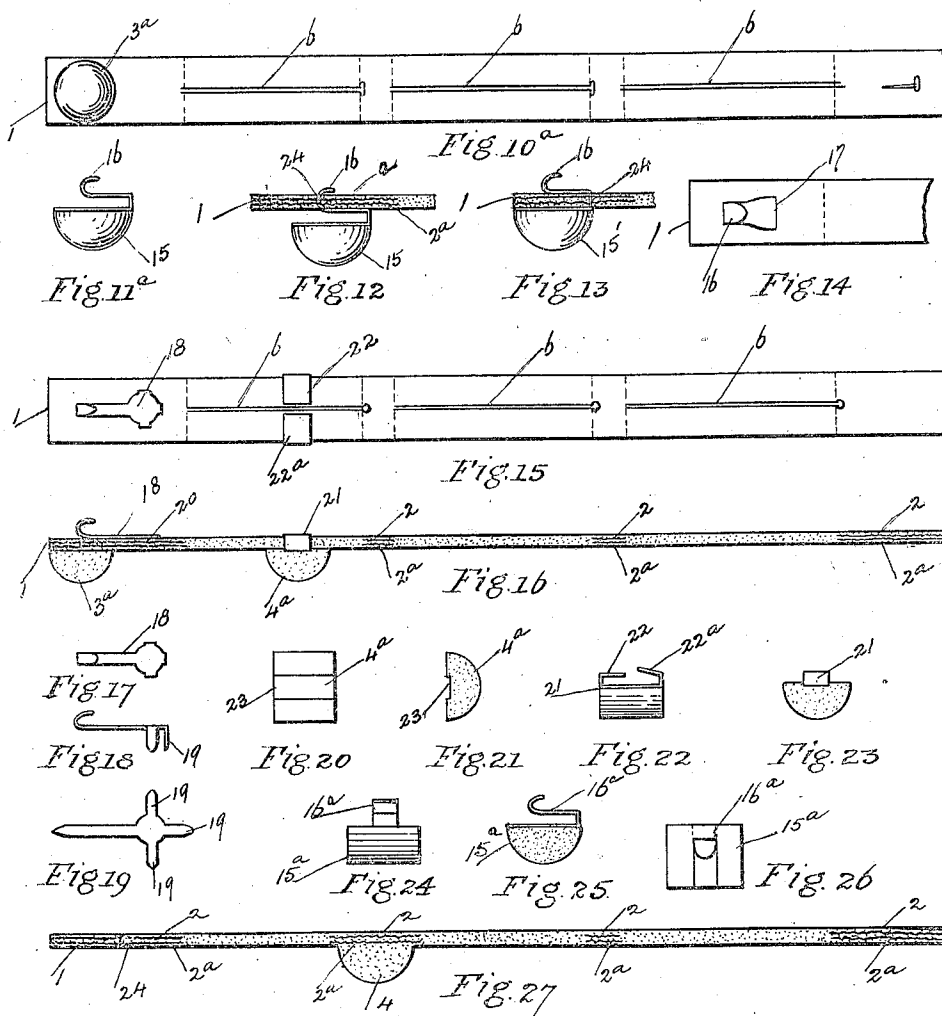
Nov. 6, 1923.

1,473,041

A. E. HENDERSON

TOURNIQUET

Original Filed July 12, 1920 2 Sheets-Sheet 2



INVENTOR

Albert Emmis Henderson

UNITED STATES PATENT OFFICE.

ALBERT ENNIS HENDERSON, OF TORONTO, ONTARIO, CANADA.

TOURNIQUET.

Application filed July 12, 1920, Serial No. 395,722. Renewed March 30, 1923.

To all whom it may concern:

Be it known that I, ALBERT ENNIS HENDERSON, a subject of the King of Great Britain, residing in Toronto, Province of Ontario, Dominion of Canada, have invented certain new and useful Improvements in Tourniquets; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of the invention is to provide a tourniquet for emergency, field, hospital and private use and general adaptability under conditions requiring or indicating the necessity of its application to a member, such as the arm, leg, or finger by the patient or injured person or by an unskilled attendant or assistant, such application being made quickly and effectively, with a graduated or variable pressure or stress of compression and with reliable means of fastening, suited to the demands of the particular case, and capable of maintaining the position of the elements and the degree of pressure indefinitely.

A further object is to provide a device of this type which is of simple and relatively inexpensive construction, and which is light and durable, is not affected by moisture, and may be packed in compact form, so that it may be readily carried in a handbag, kit, first aid case or in the vest or watch pocket.

A further object is to provide a device of this type adapted to cause direct bar pressure on more than one artery or vein and to vary the relation of the pressure points to each other as may be desired.

A further object is to provide a device of such proportions, form, and adaptability that it may readily be applied to any member of the body with equal facility and efficiency without multiplying sizes.

A further object is to provide a device of this type which may be readily disinfected and repeatedly used without danger to the patient.

In the drawings:

Fig. 1. is a perspective view showing the preferred form of tourniquet in process of being placed in position on the wrist.

Fig. 2. shows the invention applied, having the pressure bars in position on the arteries of the member, under compression and having the fastening device in position.

Fig. 3. is an edge view of the preferred form of the invention showing the relation of the embedded fabric strips, the fastening hook, and pressure bars to each other.

Fig. 4. is top plan view of the device shown in Fig. 3. indicating the location of the median slots, and showing the relative position of the hook, the slots and the cross imbedded fabric in their unstretched condition.

Fig. 5. is a vertical section longitudinally through a modified form of the device shown in Fig. 3. in which only one pressure bar is shown.

Fig. 6. is a top plan view of Fig. 5.

Fig. 7. is a top plan view of Figs. 4 and 6. in extended or stretched condition, disclosing the form of the median slot under tension.

Fig. 8. is a sectional elevation of the terminal portion of the device which receives the fastening hook, showing the hook in the first stage of insertion.

Fig. 9. is the same view as Fig. 8. with the insertion of the hook advanced a further stage.

Fig. 10 shows the same section with the hook fully inserted in operative position.

Fig. 10^a shows a plan view with a modified form of pressure bar in position.

Fig. 11. is a perspective view of the hook or fastening member as used in Figs. 1 to 10.

Fig. 11^a is a perspective view showing a removable combined hook and pressure bar.

Fig. 12 illustrates the first stage of the insertion of the combined hook and pressure bar shown in Fig. 11^a.

Fig. 13. shows the hook and pressure bar shown in Fig. 12 in its operative position, in the terminal of the device.

Fig. 14. is a top plan of the terminal portion showing the hook in position.

Fig. 15. is a top plan view of the device having a fixed hook attached and provided with a secondary slidable and detachable pressure bar.

Fig. 16. is an edge view of the device shown in Fig. 15.

Figs. 17, 18, and 19. show the details of the hook as used in Figs. 15. and 16.

Figs. 20, 21, 22, and 23, show the details of the construction of the slidable secondary bar shown in Figs. 15. and 16.

Figs. 24, 25, and 26. show details of a modification of the combined hook and pres-

sure bar adapted to be removably applied to the device shown in the modified form in Fig. 27.

Essentially the tourniquet consists of a
 5 flexible and contractile band or strap of rubber, adapted to be wrapped one two or more times about a member of the body, in which it is desired to check the flow of blood, such wrapping being accomplished
 10 while the band or strap is under tension or stretched, and the band being provided with means for applying a concentrated or localized pressure, as upon an artery or vein and having terminal, or both terminal and inter-
 15 mediate, fastening members of complementary construction, whereby a comparatively light or moderate pressure, or a relatively heavy or cumulative pressure may be held, and either diminished or increased at will.
 20 The contractile energy of rubber is well known, and by utilizing this property, as through applying a plurality of superposed wraps or layers of a single band or strap it is possible to multiply the compression on
 25 the limb or member, or the pressure upon a small area, to an almost unlimited extent without straining the band beyond its safe limit of elasticity and hence without detracting from the efficiency or affecting the
 30 durability thereof.

In the illustrated embodiment of the device the band 1 is shown provided with fabric reinforcements 2 and 2^a of sea island cotton or the like which may be embedded
 35 as shown, both terminally and at one or more intermediate points. The terminal reinforcements strengthen the band at these points, and form relatively inelastic grips or finger holds and prevent tearing in the
 40 operation of the device, and moreover these reinforced area serve to carry complementary fastening members such as the hook 5. To permit of the superposition in substantially coextensive relation, of successive
 45 wraps of the band, and at the same time maintain the exposure of the projecting portion 11. of the fastening member 5. carried by the end of the first or underwrap, the body of the band is provided with median
 50 openings preferably in the form of longitudinal slots or slits 6. which extend between the fabric reinforcements (2, 2^a) and (2, 2^a) and project into the edges thereof as shown at 7. and divides the band in width
 55 to form parallel co-operative elements 14 and 14^a adapted to lie on opposite sides of the said fastening member.

The intermediate fabric insertions 2, 2^a are adapted to engage the projecting portion 11 of the hook 5. and thus provide
 60 means for securing and maintaining one, two or more wraps, less than the total number which can be formed by the band. As the band is wrapped around a limb of the
 65 patient, the tension of the first wrap may be

held by engaging one of the intermediate cross reinforcements 2, 2^a with the projecting portion 11 of the hook 5. after which a further wrap may be made. This is of special convenience when the patient is ap-
 70 plying the device to his own arm, and can use only one hand in the operation. The said intermediate fabric insertions provide for varying the compression as may be deemed necessary. Also the transverse inter-
 75 mediate reinforcements serve to secure compensative and mutual action of both elements of the band, and hold them in the proper parallel relations, both when not in use and when applying the same.

Preferably at the hook end of the band there is arranged an interior pressure bar or enlargement 3, which may be formed as an integral part of the band as shown in Figs. 1 to 10. and also in 15 and 16. or as an attachment thereto as shown in Figs. 10^a, 12,
 85 13, 14, and 27. and the overlapping or multiple wrapping of the band serves to force the button inward or toward the limb or object engaged with a force dependent upon
 90 the tension applied to the band in wrapping and the number of wraps employed. It should be noted that as the wraps are superposed they frictionally engage each other or adhere, so that practically all the longitudi-
 95 nally contractile tendency and force of the band is applied compressively upon the member, and thus there is little stress applied to the fastening members, and comparatively simple and light means may be
 100 employed for the purpose.

It may be desirable to exert direct pressure on more than one point of the member to which the device is applied. For this purpose a secondary pressure bar 4 is provided
 105 which in Fig. 3 is integrally formed with the band 1. The inserted fabric 2, 2^a, in connection with the said bar serving to give firmness and rigidity to the same. The device with the secondary bar is shown in Fig. 2. in its applied position, while in Fig. 1. it is shown in process of application.

In Fig. 11. the fastening member 5. is shown in detail having the cross portion 8 which lying adjacent to the pressure bar 3 maintains the hook in its longitudinal position in the band, the upwardly extending
 115 portion 9 passes through the body of the band while the forwardly extending portion 10, carries the hook portion 11, over the cross pressure bar 3 thus adding to the natural pressure of the rubber the downward force of the strain upon the fastening member.

In Figs. 8, 9, and 10 are shown the various stages in the insertion of the fastening hook 5, into the band 1. The hook portion 11 of the fastening member 5 is inserted through
 125 the band at the point 12 where an opening is provided through the reinforced portion
 130

of the band 1 adjacent to the terminal pressure bar 3, the fabric insertion preventing the tearing or enlarging of the hole and thus providing a durable connection.

ly weak construction or material, so as to provide for the application to the affected member any desired compressive force between widely different extremes.

Having thus described my invention, 70 what I claim as new and desire to secure by Letters Patent is:

1. A tourniquet consisting of a flexible contractile band capable of being wrapped under tension one or more times around a 75 member and having an interior integral surface bar for conveying localized pressure.

2. A tourniquet consisting of a rubber band having an interior integral surface bar, and means for fastening the free end 80 after wrapping around a member.

3. A tourniquet consisting of an elastic band having an integral pressure bar and a fastening device of which complementary 85 members are carried by overlapping portions of the band.

4. A tourniquet consisting of an elastic band adapted for application in a plurality of wraps about a member and having a transverse terminal pressure bar and fastening device, the band having an intermediate opening to receive and expose the member carried by the overwrapped terminal. 90

5. A tourniquet consisting of an elastic band provided at its terminal with a fastening member and intermediately slotted at intervals to straddle the said member. 95

6. A tourniquet consisting of an elastic band provided at its terminal with a pressure bar and fastening member and intermediately slotted to straddle the said member, and having transverse strengthened portions at intervals throughout its length. 100

7. A tourniquet consisting of an elastic band provided at one of its terminals with a pressure bar and a fastening member and intermediately slotted at intervals to straddle the said fastening member, said slots terminating in fabric strengthened portions 105 of the band.

8. A tourniquet consisting of an elastic band provided at one of its terminals with a pressure bar and fastening device, intermediately slotted at intervals to straddle the said fastening member and having at 110 the free terminal and intermediate points embedded fabric portions adapted to engage the projecting portion of the said fastening member.

9. A tourniquet consisting of an elastic band provided at its terminals with complementary fastening members and intermediately slotted to straddle one of said members, and a stop for holding successive wraps in coextensive relation. 120

10. A tourniquet consisting of an elastic band provided with a terminal transverse pressure bar and complementary fastening members one of which is located adjacent to the said bar. 125

5 In Fig. 7 is shown a portion of the band 1 under tension the effect of the said stretching being to open a space between the parallel members 14, and 14^a thus widening the median slot 6 so as readily to straddle the hook portion of the fastening member 5. The result of the production of the central space is to maintain a wider contact area between the band and the member to which it is applied. The extension of the slot 6 15 beyond the edge of the transverse reinforced portions as shown at 7 Fig. 6 ensures the strengthening of the band against tearing at this point when engaging the hook portion of the fastener 5.

20 In Fig. 10^a is shown the band 1 having the slots 6 and a modified form of pressure bar 3^a, in position.

Fig. 11^a shows the modified form of pressure member 15 having the hook 16 integral therewith, while in Fig. 12 the device shown in Fig. 11^a is shown in the first stage of insertion into the band 1, through the transverse slot 24, and in Fig. 13 the device is shown in place at the terminal of the band 1. Fig. 14 is a top plan view of the same showing the wide portion 17 of the hook which engages the transverse slot 24 in the band 1. 30

In Figs. 15 and 16 are shown the modified form of fastener 18 having the projecting prongs 19 which pass through the band 1, at the point 20. Slidably mounted upon the band 1 is the secondary pressure bar 4^a, having the securing means 21 provided with the overlapping portions 22 and 22^a, said means being secured to the bar in the groove 23, said device being shown in detail in Figs. 20, 21, 22, and 23. 35

Figs. 24, 25, and 26 show a modified form of detachable combined pressure bar and hook 15^a and 16^a while Fig. 27 shows the device having the secondary bar integral therewith while the terminal portion is apertured at 24 and adapted to receive the pressure bar and hook as shown in Figs. 25 and 26. 40

While the device as disclosed is useful as an element of the operating room equipment, in being adapted for all the purposes contemplated by surgery in this connection, it is designed and peculiarly suited for first-aid and emergency application, in that it can be carried in compact form, and can be adjusted quickly and effectively by an unskilled operator either to himself or another, and with any required degree of compression, and owing to the cumulative effect of the multiple wraps or folds having a cooperative relation when applied, the band 65 may be of comparatively light or torsional-

11. A tourniquet consisting of an elastic band provided with a pressure bar and complementary fastening members one of which consists of a hook disposed to communicate pressure to the said bar.
12. A tourniquet consisting of an elastic band provided with terminal complementary fastening members one of which is an outward projection, the band being longitudinally split to straddle said projecting member and having an intermediate cross-piece to engage the same.
13. A tourniquet consisting of an elastic band provided with reinforced terminal areas having complementary fastening members, and longitudinally slitted at intervals between the said areas to straddle the fastening member at one end.
14. A tourniquet consisting of an elastic band reinforced at terminal and intermediate points and slitted longitudinally between the reinforced areas, and complementary fastening devices located at the terminal reinforced areas.
15. A tourniquet consisting of an elastic band adapted for plural ply arrangement in successive superposed cooperatively related wraps, and a removable hook adjacent to one terminal of the same.
16. A tourniquet consisting of an elastic band arranged in successively applicable, coextensively superposed cooperatively related wraps or folds.
17. A tourniquet consisting of an elastic band divided longitudinally at intervals to form parallel cooperating elements and adapted for arrangement in superposed cooperatively related wraps, and terminal complementary fastening members for engagement in a plane between said elements.
18. A tourniquet consisting of an elastic band provided at its terminal with a pressure bar and a fastening member and intermediately slotted at intervals to straddle the said member, and having a secondary pressure bar carried by the band.
19. A tourniquet consisting of an elastic band having a terminal pressure bar and a fastening member adjacent thereto, and intermediately slotted at intervals to straddle the said member, and having a secondary pressure bar adjustably related to the terminal pressure bar.
20. A tourniquet consisting of an elastic band provided with a removable fastening member, and having a plurality of adjustably related interior pressure bars carried by the said band.
21. A tourniquet consisting of an elastic band provided with a terminal pressure bar integral therewith a secondary pressure bar carried by the band adjustably related to the terminal bar, and fastening means adapted to communicate pressure to the said bars.
22. A tourniquet consisting of an elastic band, provided with a terminal pressure-bar and fastening member, and having strengthening cross-bars of fabric at intervals, adapted to maintain, under pressure, the normal width of the band.
23. A tourniquet consisting of an elastic band provided with a terminal transverse pressure-bar and fastening means and having longitudinal slots to expose the fastening means, and a secondary pressure-bar carried by the band.
24. A tourniquet consisting of an elastic band, longitudinally slotted at intervals, having transverse strengthened portions between the slots, and provided with a terminal fastening device adapted to engage the transverse strengthened portions.
25. A tourniquet consisting of an elastic band intermediately slotted at intervals, said slots terminating in strengthened portions and a fastening device terminally located, and adapted to project through the slots to engage the free end of the band.
26. A tourniquet consisting of a band intermediately slotted at intervals and a fastening device terminally located, and adapted to project through the slots and engage the free end of the band.
27. A tourniquet consisting of an elastic band provided with slots and strengthened portions at intervals, and having a terminal pressure bar and fastening device, carried by the band.

ALBERT ENNIS HENDERSON.