

June 12, 1934.

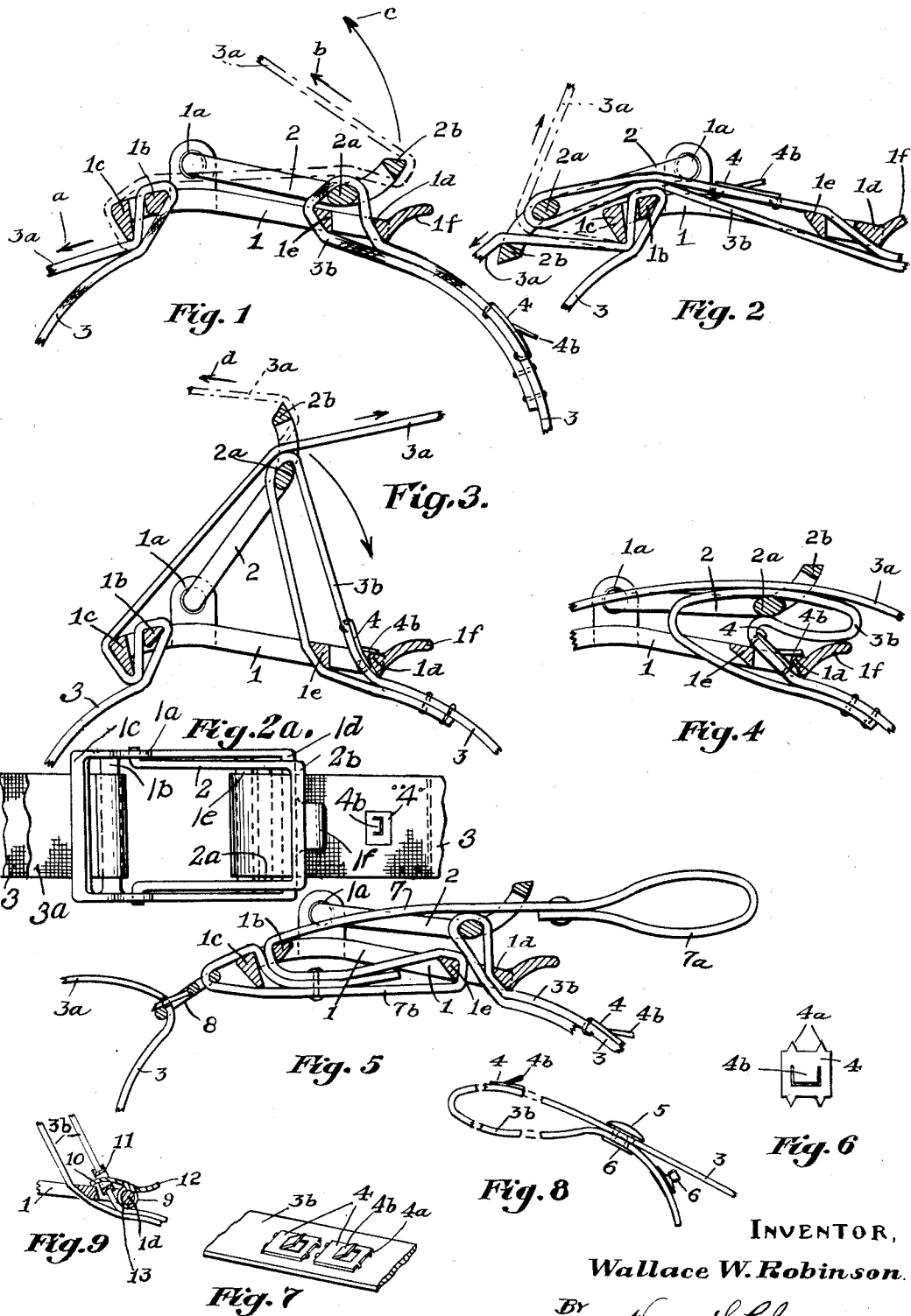
W. W. ROBINSON

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TOURNIQUET

Filed April 29, 1933

2 Sheets-Sheet 1



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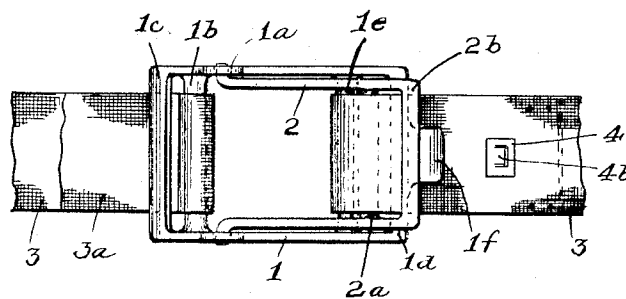
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UNITED STATES PATENT OFFICE

1,962,285

TOURNIQUET

Wallace Wilson Robinson, Portland, Maine

Application April 29, 1933, Serial No. 668,566

5 Claims. (Cl. 128—327)

The invention hereinafter to be described relates, in general terms, to surgical instruments, but is concerned more particularly with improvements in a lever-type tourniquet, a device employed to constrict the flesh of an arm or leg adjacent a bleeding wound for the purpose of preventing exsanguination of the person injured.

In the preliminary or first aid treatment of copiously bleeding wounds the circumscription or binding of the limb of the patient should be attended to without delay and a tension on the tourniquet strap applied of sufficient strength to immediately stay the outflow of blood.

This tension, however, should be somewhat slackened after a definite period else a gangrenous condition, due to continued interference with arterial and collateral circulation, will develop.

The present invention, which I consider an improvement on a device for a like purpose and on which Letters Patent of the United States, No. 1,712,584 were granted me on May 14, 1929, deals with structure by means of which it is possible, when desired, to relax the extreme or full tension of the tourniquet strap by such an amount as will permit of circulation of the blood through some of the blood vessels being resumed and at the same time maintaining a certain pressure control over arterial circulation.

When the tourniquet strap is applied and fully tensioned, circulation stops in both arteries and veins. Except in cases where the limb has been severed resumption of circulation through the uncut blood-carrying vessels should be allowed to take place as soon as possible after the blood ceases to flow from the wound.

The blood in and at the point of severance of an artery usually coagulates quickly, but until such time as the coagulum has safely and positively plugged its orifice the extreme strap tension on the artery should be continued.

When, at the proper time, this extreme pressure constriction of the limb is relaxed, it should at first be only a partial lessening of the strap tension, for, should the binding pressure be prematurely and completely removed, the possibility of again starting bleeding of the artery or blood vessels by re-opening their coagulum-plugged ends would be present.

By prolonging this period of lessened strap tension the situation for the time being is taken care of and circulation through the intact, smaller blood vessels re-established. Nature, in

due course, will provide for the return of normal functioning of the arteries by anastomosis, meaning, inosculation of the branches of the blood circulatory system.

In carrying out my invention in practice I mount on the loop end portion of the tourniquet strap a stop-lug element which, when the tensioning lever is swung away from its full tension position permitting a portion of the strap loop to recede from under the tourniquet base member, automatically engages a cross-bar serving on this occasion as a stop to prevent further withdrawal at this time of the strap.

The strap is now locked in an intermediate-tension position and this condition prevails until it is considered safe to remove this lower degree of constriction and permit the parts to resume their original or initial binding effort, such as obtained when the instrument was first applied to the injured limb. As a precautionary measure the tourniquet may be left on the limb, all tension removed, until possible recurrence of bleeding is thought to be passed.

In my former patented device, hereinbefore referred to, the locking of the strap for intermediate tension was accomplished by securing the lever in this intermediate position, whereas in my present conception the strap, itself, is the element secured and the lever is free to move into juxtaposition to the base member which greatly compacts the parts.

Furthermore, a greater capacity for or latitude of strap tension release is provided in my present than was the case in my former invention, as with the latter, when the lever approached the "dead center" line of action, it became inoperative, with respect to intermediate tension requirements.

I have illustrated my invention in the accompanying drawings in which,—

Fig. 1 is a central, longitudinal sectional elevation of the tourniquet base and lever, the strap being shown in full lines and in initial tension;

Fig. 2 is the same as Fig. 1 except that the lever has been swung to the opposite side of the base member, bringing the strap into full tension;

Fig. 2a is a plan view of the parts shown in Fig. 1.

Fig. 3 shows the lever raised into intermediate position, with the strap locked in intermediate tension;

Fig. 4 shows the lever lowered and compacted;

Fig. 5 is a modified form of strap assembly;

Fig. 6 is the blank from which the stop-lug is made;

Fig. 7 shows a portion of the loop of the strap with a plurality of the stop-lugs mounted thereon;

Fig. 8 illustrates a method of lengthening or shortening the loop to re-position the stop-lug; and

Fig. 9 shows an alternate form of loop lock. Like reference characters indicate like parts.

As the tourniquet in which my present invention is embodied operates on substantially the same principle as the one I have previously patented and hereinbefore referred to, it is deemed sufficient disclosure at this time to point out those features only which are essential to a clear understanding of the connection between that which is old and that which is new.

Primarily, my tourniquet comprises three principal elements, the base member 1, the tensioning lever 2, and the strap 3.

The lever is pivotally mounted on the base member at some intermediate point thereon, as at 1a, and is adapted to swing, in the operation of the device, in either direction.

In the present embodiment the strap is reeved through the parts in a somewhat different manner from that adopted in my previously mentioned device, but the same ends are sought and attained by the use of either method, except as will be hereinafter set forth.

After the tourniquet has been placed on the bleeding limb of the patient, on that side of the wound nearer the heart, the free end 3a of the strap is drawn taut in the direction of the arrow a, in Fig. 1, frictionally locking itself as it weaves around the cross-bars 1b and 1c, and exerting what I call the initial strain or tension of the strap around the injured limb. The position of the parts at this time are as shown in full lines in Fig. 1, the loop 3b of the strap engaging the cross-bar 2a of the lever 2.

But this initial strain is hardly sufficient to stay the flow of blood and the operation is designed simply to create a circumferential, binding pressure slightly in excess of that required to take up the slack of the strap.

To procure a tension on the strap which will prevent further bleeding the free end 3a of the strap is swung over and reeved between the cross-bars 2a and 2b of the lever, then backwardly, as shown in dot and dash lines (Fig. 1). By a strong grasp and pull on the strap in the direction of the arrow b the lever is raised and swung over on to the opposite end of the base member, moving in the direction of the arrow c, the parts then being disposed as seen in Fig. 2.

By this swing of the lever the looped end of the strap has been brought further into the base member, shortening the working length and increasing the constricting effort of the strap around the injured limb. This particular tightening operation, from initial to full strain of the strap I designate as the lever "take-up" tension.

In service, the period during which this lever "take-up" tension should be continued varies with circumstances which cannot always be foretold and for this reason its determination is best left to the judgment of the medical practitioner or other competent person attending the patient; but eventually it must be reduced, and reduced by degrees, otherwise if the tension-release operation is performed prematurely or the binding pressure suddenly and

completely removed untold injury might be done the patient.

To accomplish this step-down or reduction in constriction pressure I provide a stop-lug 4 shown in blank form in Fig. 6 as I preferably construct it. It comprises a thin plate having fastener ears 4a on its ends and a lug or tongue 4b partially sheared from the central portion of the plate.

The ears 4a are bent and clinched in the strap and the tongue 4b bent outwardly, as shown in Fig. 1.

As the lever 2 moves from Fig. 1 to Fig. 2 position it draws the loop 3b into and over the base member 1, the stop-lug 4 now being disposed on the top of the loop substantially midway the length of the base member 1. The loop is preferably arranged as shown in Fig. 1 in which the outer course of the loop lies between the two cross-bars 1d and 1e, the loop itself encircling the bars 1e and 2a.

When it is desired to reduce the strap tension the lever 2 is swung back toward its original position permitting the strap loop to move out from under the base member a certain distance. When the lever arrives at a position shown in Fig. 3 the stop-lug ear portion 4b engages the cross-bar 1d, halting further movement of the strap for the time being, and locking it positively and automatically in this intermediate tension position.

The lever is now free to continue its retractive movement and in Fig. 4 it is shown depressed and compacted close to the base member and loop.

In certain instances it might be desirable to provide structure whereby the full tension of the strap could be released by a series of step-down movements or consecutive relaxings of the binding pressure.

In Fig. 7 is shown a short portion of the strap loop with a plurality of the stop-lugs 4 secured thereto, each adaptable of engaging the cross-bar 1d and effecting various degrees of strap tension.

As the tourniquet instrument is largely used by physicians who have their own individual ideas as to the proper amount of strap tension release, I have provided an alternate method of procuring various amounts of step-down pressure with but one of the stop-lugs employed.

I illustrate this feature in Fig. 8 in which is shown a snap button 5 which is secured on the strap and is engageable with its mating part 6 secured on the free end of the loop portion. A plurality of the elements 6 may be employed, each adapted to be engaged by the part 5, changing from one to another either lengthening or shortening the loop 3b by an amount one-half the distance between each element 6.

In Fig. 5 I show an alternative method of reeving the strap element in the parts 1 and 2. In this instance there are two straps, 3 and 7, the latter having a loop handle 7a used in actuating the lever 2, and an inwardly disposed portion 7b which acts to protect the flesh from direct contact with the metal parts of the tourniquet. In this design I employ a buckle 8 which is used in taking up the slack and putting the strap under initial tension. The essence of my invention as it pertains to strap release tension is retained in the tourniquet illustrated in Fig. 5.

When it is desired to release the stop-lug from engagement with the cross-bar 1d and return

the strap to its initial tension position the free end 3a of the strap is grasped and the lever raised somewhat beyond its position in Fig. 3—lifting the stop-lug off the cross-bar. Then by lifting on the finger-hold 1e of the base member the cross-bar is elevated sufficiently to permit of the stop-lug passing downwardly by it without interference. The strap loop will now be positioned as shown in Fig. 1.

In Fig. 9 I illustrate a modification in the arrangement of the locking parts to retain the strap in intermediate tension. In this instance a sleeve 9 is revolvably mounted on the cross-bar 1d, and on the sleeve is a pawl 10 which, when the strap loop 3b is withdrawing out of the base member, engages a rivet eyelet 11 secured in the outer course of the strap loop. A trip tongue 12 is employed to release the pawl from the eyelet.

The sleeve 9 is split and somewhat opened at 13 for the purpose of increasing the frictional resistance of the strap as it draws across the sleeve on its downward movement. It thus acts to automatically throw the pawl against the strap and into the opening in the eyelet when the two come abreast.

The Fig. 9 embodiment, although different in structure, has the same functional characteristic as does the Fig. 1 example in that the strap, in distinction to the lever, is the element locked in intermediate tension.

I claim:

1. A tourniquet comprising in combination with a base member and a lever pivotally mounted thereon, a strap, means to secure one end of said strap to said base member, a loop on the opposite end of said strap, a cross-bar on said lever engaging said loop and adapted, when said lever is advanced, to fully tension said strap, and means, when said lever is retracted, to secure said loop on said base member with said strap in intermediate release tension.

2. A tourniquet comprising in combination, a base member, a lever pivotally mounted on and adapted to swing in both directions from its pivotal point on said base member, a strap having one end frictionally secured on said base member, a loop on the opposite end of said strap, a cross-bar on said lever engaging said loop and providing, when said lever is swung from its retracted to its fully advanced position, the lever take-up tension for said strap, and a stop-lug on said loop adapted when said lever is on its retractive movement to engage said base member and positively hold said strap against further, immediate constrictive tension release.

3. A tourniquet comprising in combination

with a base member and a strap-tensioning lever pivotally mounted thereon, a constriction strap extending through said base member and adjustably secured to a transverse bar of said lever, said strap being adjustably secured at its opposite end to said base member, and a stop-lug on the said strap, adapted to automatically engage the said base member upon retraction of said lever, whereby a predetermined amount of binding tension is released and the strap held to positively maintain this reduced constriction pressure.

4. A device of the character described comprising in combination a base member, a bar disposed across one end of said base member, a second bar located on said base member in spaced and parallel relation to said first mentioned bar, a strap-tensioning lever pivotally mounted on said base member adaptable of swinging in both directions from its pivotal point thereon, a strap one end of which makes adjustable connection with the opposite end of said base member, a loop on the other end of said strap, said loop encircling said second bar and operatively connected with said lever, and contacting means on said loop and said base member whereby said strap may be locked against retraction from said base member while in an intermediate degree of constriction tension.

5. A tourniquet comprising in combination with a base member having a plurality of transversely disposed bars thereon and a lever, having a cross-bar near its free end, pivotally mounted on said base member, a strap one end of which is adapted to be reeved over and between the transversely disposed bars on said base member and frictionally held thereon after being tautened to provide an initial tension on said strap, the free end of said lever being at this time disposed on the end of said base member opposite to that on which are said transversely disposed bars, a loop on the opposite end of said strap engaging the cross-bar on said lever, said strap being brought into full constriction tension when said lever is swung to the opposite end of said base member, adjacent said transversely disposed bars, and means whereby when the full tension on said strap is relaxed a predetermined amount by the retraction of said lever from its fully advanced position and the partial withdrawal of said loop from said base member, the loop, itself, is automatically locked on said base member and held against further, immediate tension release, said lever now being free to swing into compacted relation with said base member, adjacent said loop.

WALLACE WILSON ROBINSON.