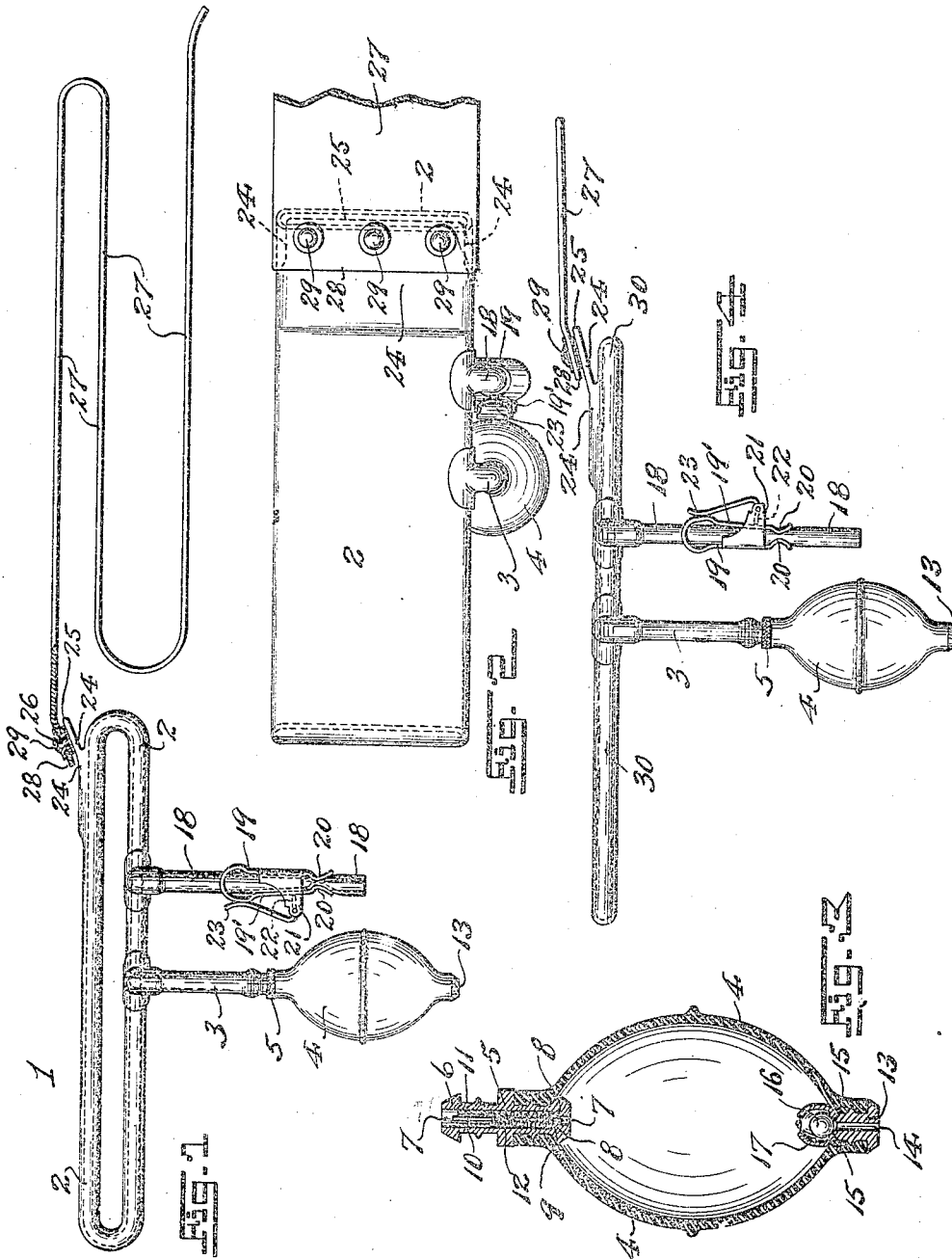


W. LEVINE.
SURGICAL TOURNIQUET.
APPLICATION FILED JUNE 27, 1917.

1,269,620.

Patented June 18, 1918.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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SURGICAL TOURNIQUET.

1,369,620.

Specification of Letters Patent. Patented June 18, 1918.

Application filed June 27, 1917. Serial No. 177,166.

To all whom it may concern:

Be it known that I, WILLIAM LEVINE, a citizen of the United States, residing at Princeton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Surgical 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, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention relates, generally, to improvements in surgical tourniquets; and the invention has reference, more particularly, to an improved construction of pneumatic tourniquet.

The invention has for its principal object to provide a very simple and effective construction of tourniquet adapted to be very quickly and easily applied and manipulated, and which operates upon pneumatic principles, whereby air pressure may be applied to the person of the patient in proper location to effectively close the desired arteries, and thereby stop the circulation of blood in the arm or leg of the patient, as the case may demand.

The invention has for a further object to provide an elastic hollow body for application upon the person of the patient, said body being provided with means for introducing air under pressure within said body, and having means for controlling the pressure of the compressed air so as to direct the same inwardly against the person of the patient, and having additional vent or exhaust means for permitting the escape of the air from said body when desired, together with a suitable shut-off device for normally closing said vent or exhaust means against the escape of the air therethrough.

Other objects of the present invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the present invention.

With the various objects of my present invention in view, the same consists, primarily, in the novel construction of pneumatic tourniquet hereinafter set forth; and, the invention consists, furthermore, in the novel arrangements and combinations of the various devices and parts, as well as in the details

of the construction of the same, all of which will be more fully described in detail in the following specification, and then finally embodied in the appended claims.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevation of the novel construction of pneumatic tourniquet, made according to and embodying the principles of my present invention; Fig. 2 is a plan view of the same; and Fig. 3 is a detail vertical longitudinal section of the squeeze-bulb pump mechanism for introducing the air under pressure within the tourniquet body, said view being drawn on an enlarged scale. Fig. 4 is a side elevation of a slightly modified form of construction of my novel pneumatic tourniquet, the same still embodying, however, the general principles of my present invention.

Similar characters of reference are employed in all of the hereinabove described views to indicate corresponding parts.

Referring now to the said drawings the reference character 1 indicates the complete pneumatic tourniquet, made according to and embodying the principles of my present invention, the same comprising a hollow body 2 of soft rubber or other suitable elastic material. Preferably this hollow body 2 is made in continuous tubular form of circular band-like design. Joined to one edge of said hollow body 2, so as to communicate therewith, is a tubular extension 3 adapted to provide an air intake conduit. Secured to the free end of said tubular extension 3 is an air pumping device. Said air pumping device is preferably made in the form of a soft rubber squeeze-bulb 4, having at its inner end a valve case 5 provided with an exteriorly extending neck 6 upon which said free end of said tubular extension 3 is secured to attach said squeeze-bulb 4 operatively in communication with said hollow-body 2. Said valve case 5 is provided with an interior longitudinally extending tubular opening or passage 7 at the inner end of which is provided a suitable valve seat 8. Located within said opening or passage 7 is a valve-member 9 having normal engagement with said valve seat 8, and the same being provided with an upwardly extending stem 10. Secured within the upper end of said opening or passage 7 is a suitable sleeve or bushing 11 through which said stem 10 extends so as to be guided thereby. A spring 12 ar-

ranged between said sleeve or bushing 11 and said valve-member 9 tends to normally thrust the latter downward in seated relation upon said valve-seat 8, and thus in closing relation to the opening or passage 7. Said squeeze-bulb 4 is provided at its outer end with a tubular fitting 13 having a longitudinal air inlet passage 14 at the upper end of which is formed a valve seat 15. Cooperating with said valve seat 15 is a ball-valve 16, the same being maintained in proper association with the valve seat by means of a guard cage 17. Said ball-valve 16 acts as a check-valve against the outward escape of air from the inlet passage 14 when operating said squeeze-bulb. In operating the squeeze-bulb 4 to introduce air into the hollow body 2, the bulb 4 is squeezed or collapsed which drives the air contained therein outward through the opening or passage 7 and tubular extension 3 into the interior of the hollow body 2, the air in its outward passage lifting the valve-member 9 to open said passage 7. The pressure of the air against the ball-valve 16 forces the same to its seat thus closing the inlet passage 14 against the escape of air therethrough, and compelling the air to discharge only through the outlet passage 7. When the squeezing pressure upon the bulb 4 is released, the tendency of the same is to resume normal shape. In so doing a suction is created within the interior of the bulb 4. Since, however, the valve-member 9 is both closed by the spring 12 and the back pressure of the air already introduced within the hollow-body 2, this suction can only exert its force upon the ball-valve 16, which lifts from the valve-seat 15 and this opens the passage 14 so that a new supply of air may rush into the interior of the bulb, ready to be forced on into the body 2, when the bulb 4 is again squeezed or collapsed. These operations are repeated until the required amount of air has been introduced and compressed within the hollow-body 2, as will readily be understood. While the squeeze-bulb construction of pumping device, thus above described, is a very convenient and well known device for the purpose in view, I do not wish to be understood as limiting myself entirely to its use in connection with my novel pneumatic tourniquet, since it will be quite apparent that there are many other forms and constructions of air pumping devices, which may be used with equal efficiency in connection with my pneumatic tourniquet.

Also joined to one edge of said hollow-body, preferably in a location adjacent to said tubular extension 3, is another tubular extension 18, arranged so as to communicate with the interior of said hollow body 2, and adapted to provide an air exhaust or outlet passage leading therefrom. Preferably said tubular extension 18 is made of

soft rubber, and arranged thereon is a closure member for normally closing the passage of said tubular extension against the escape of air therethrough from said hollow body 2. This closure member is preferably constructed in the form of a restricting clamp comprising a pair of spring arms 19 and 19' having gripping-lips 20 between which said tubular extension 18 passes. Connected with said arm 19 are bearing-lugs 21 which extend laterally past and in straddling relation to the other spring arm 19'. Journalled in the free end of said bearing-lugs is a clamp-jaw 22 with which is connected a suitable operating lever 23. When said lever 23 is properly manipulated it causes the clamp jaw 22 to press inwardly upon said spring-arm 19' forcing the same against the opposite spring-arm 19, and thus causing the gripping lips 20 to grip between them the body of said tubular extension 18 to restrict and collapse the same, and thereby close the passage thereof against the escape of air therethrough. When desired the lever 23 may be manipulated to swing said clamp-jaw away from the spring-arm 19', thus permitting the same to separate from the spring arm 19, and thus causing said gripping-lips 20 to move apart and out of gripping engagement with the tubular extension 18 so that the latter may open and thus permit the air contained within the hollow body 2 to quickly escape, and thus causing the pneumatic tourniquet to collapse to its inoperative condition, so that the same can be readily removed from the patient when desired.

Connected with the outer surface of said hollow-body 2, and preferably forming an integral part thereof, is an outwardly extending tongue or flap 24, the same being provided adjacent to its free marginal edge 25, with a plurality of fastening devices 26. The reference character 27 indicates a flexible binder which may be made of any-suitable non-elastic flexible material, such as cloth, leather, etc.; one end of said binder 27 is provided adjacent to its lateral marginal edge 28 with a plurality of female fastening devices 29, adapted to be engaged with said fastening devices 26 of said tongue or flap 24, for the purpose of securing one end of said binder 27 to said hollow-body 2.

In using the novel pneumatic tourniquet, constructed as above described, the said hollow-body 2 is slipped over the arm or leg of the patient upon whom its use is desired. The binder 27 is secured by the fastening devices to the tongue or flap 24, and then wound around the exterior surface of said hollow body 2 in embracing or encircling relation thereto, and the free end of said binder may be secured against unwrapping by means of a safety pin or other suitable fastening device. The hollow-body 2 and its

binder 27, being thus applied to the patient, is ready for inflation. To this end the pumping device is manipulated to introduce air under pressure into the hollow-body 2. The

5 air entering said elastic hollow-body 2 inflates and expands the same, but since the non-elastic binder 27 surrounds the exterior surface of said hollow-body 2, the same holds the said hollow-body against outward ex-
 10 pansion, and directs the full force of the expanding compressed air inwardly against the arm or leg of the patient, thus exerting a great restrictive pressure upon said arm or leg which results in a closure of the arteries
 15 and a stoppage of blood circulation or flow through the arm or leg. The amount of pressure desired to be exerted by the tourniquet may be easily regulated by the amount of air introduced into the hollow-body, so
 20 that the efficient action of the tourniquet may be easily and quickly attained. When it is desired to release the tourniquet from the patient, all that is necessary to be done is to open the closure member on the discharge
 25 tubular extension 18 so that the air is quickly vented from the hollow-body 2, and then, after unwinding the binder 27, the hollow-body 2 may be quickly slipped off of the patient's arm or leg.

30 If in using the tourniquet it is found that the hollow-body is larger in circumference than is necessary to snugly accommodate the same to the arm or leg of the patient, then the hollow-body is looped around and the surplus gathered together and folded back
 35 over the encircling portion, before wrapping around the binder 27, then when the binder is wrapped around this fold the hollow-body is held in place, and air may be intro-
 40 duced into the encircling portion of the hollow-body with the properly applied inwardly directed expansive effect above described.

The binder 22, being removable, may be easily and quickly detached for cleansing and sterilizing purposes, and then replaced for further use.

Referring now to Fig. 4 of the drawings, I have illustrated therein a slightly modified form of my novel pneumatic tourniquet. In
 50 this construction instead of providing an elastic hollow body by circular form, as shown in Figs. 1 and 2, I provide a flat elastic hollow body 30, which may be wrapped around the arm or leg of the patient
 55 in embracing relation thereto. This flat hollow body 30 is equipped and otherwise constructed in the same manner as already above described in connection with the first mentioned construction, as will be apparent by
 60 the application in said Fig. 4 of similar characters of reference thereto to denote the corresponding parts. The binder 27 is wrapped around the flat hollow body, after the same has been placed in embracing rela-
 65 tion to the arm or leg of the patient, and the

manner of manipulating the same is otherwise the same as already above described in connection with the first mentioned construction.

I am aware that some changes may be 70 made in the arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, without departing from the scope of my present invention as set forth in the 75 foregoing specification and as defined in the claims appended hereto. Hence, I do not limit my invention to the exact arrangements and combinations of the various parts as described in the foregoing specification, 80 nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

I claim:—

1. A pneumatic tourniquet comprising a 85 continuous tubular elastic body, an air pumping device connected with said body so as to communicate with its interior, and a normally closed air escape means connected with said body in communication 90 with its interior.

2. A pneumatic tourniquet comprising a continuous tubular elastic body, an air pumping device connected with said body so 95 as to communicate with its interior, a normally closed air escape means connected with said body in communication with its interior, an exterior flap integrally connected with the outer surface of said body, a binder of non-elastic flexible material, and 100 means for detachably securing one end of said binder to said flap.

3. A pneumatic tourniquet comprising a continuous tubular elastic body, an air pumping device connected with said body 105 so as to communicate with its interior, a normally closed air escape means connected with said body in communication with its interior, and a flexible binder member of non-elastic material adapted to be wrapped 110 exteriorly about said body when in use.

4. A pneumatic tourniquet comprising a hollow body of elastic material, an air inlet tube connected with said body, an air pump- 115 ing device secured to the outer end of said inlet tube, an air outlet tube connected with said body, means for normally closing said outlet tube against the escape of air there- through, and a flexible binder member of non-elastic material adapted to be wrapped 120 exteriorly about said body when in use.

5. A pneumatic tourniquet comprising a hollow body of elastic material, an air inlet tube connected with said body, an air pump- 125 ing device secured to the outer end of said inlet tube, an air outlet tube connected with said body, means for normally closing said outlet tube against the escape of air there- through, an exterior flap integrally connected with the outer surface of said

body, a binder of non-elastic flexible material, and means for detachably securing one end of said binder to said flap.

6. A pneumatic tourniquet comprising an
5 endless tubular elastic body, an air inlet
tube connected with the marginal edge of
said body at one side thereof, an air pump-
ing device secured to the outer end of said
inlet tube, an air outlet tube connected with
10 the marginal edge of said body at one side
thereof, means for normally closing said
outlet tube against the escape of air there-
through, and means connected with said
body adapted to prevent outward expansion
15 thereof under internal air pressure.

7. A pneumatic tourniquet comprising
an endless tubular elastic body, an air out-
let tube connected with the marginal edge
of said body at one side thereof, an air
20 pumping device secured to the outer end of
said inlet tube, an air outlet tube connected
with the marginal edge of said body at one
side thereof, means for normally closing
said outlet tube against the escape of air
25 therethrough, and a flexible binder member

of non-elastic material adapted to be
wrapped exteriorly about said body when
in use.

8. A pneumatic tourniquet comprising an
endless tubular elastic body, an air inlet 30
tube connected with the marginal edge of
said body at one side thereof, an air pump-
ing device secured to the outer end of said
inlet tube, an air outlet tube connected with
the marginal edge of said body at one side 35
thereof, means for normally closing said
outlet tube against the escape of air there-
through, an exterior flap integrally connect-
ed with the outer surface of said body, a
binder of non-elastic flexible material, and 40
means for detachably securing one end of
said binder to said flap.

In testimony that I claim the invention
set forth above I have hereunto set my hand
this 26th day of June, 1917.

WILLIAM LEVINE.

Witnesses:

FREDK. C. FRAENTZEL,

FRED'K H. W. FRAENTZEL.