

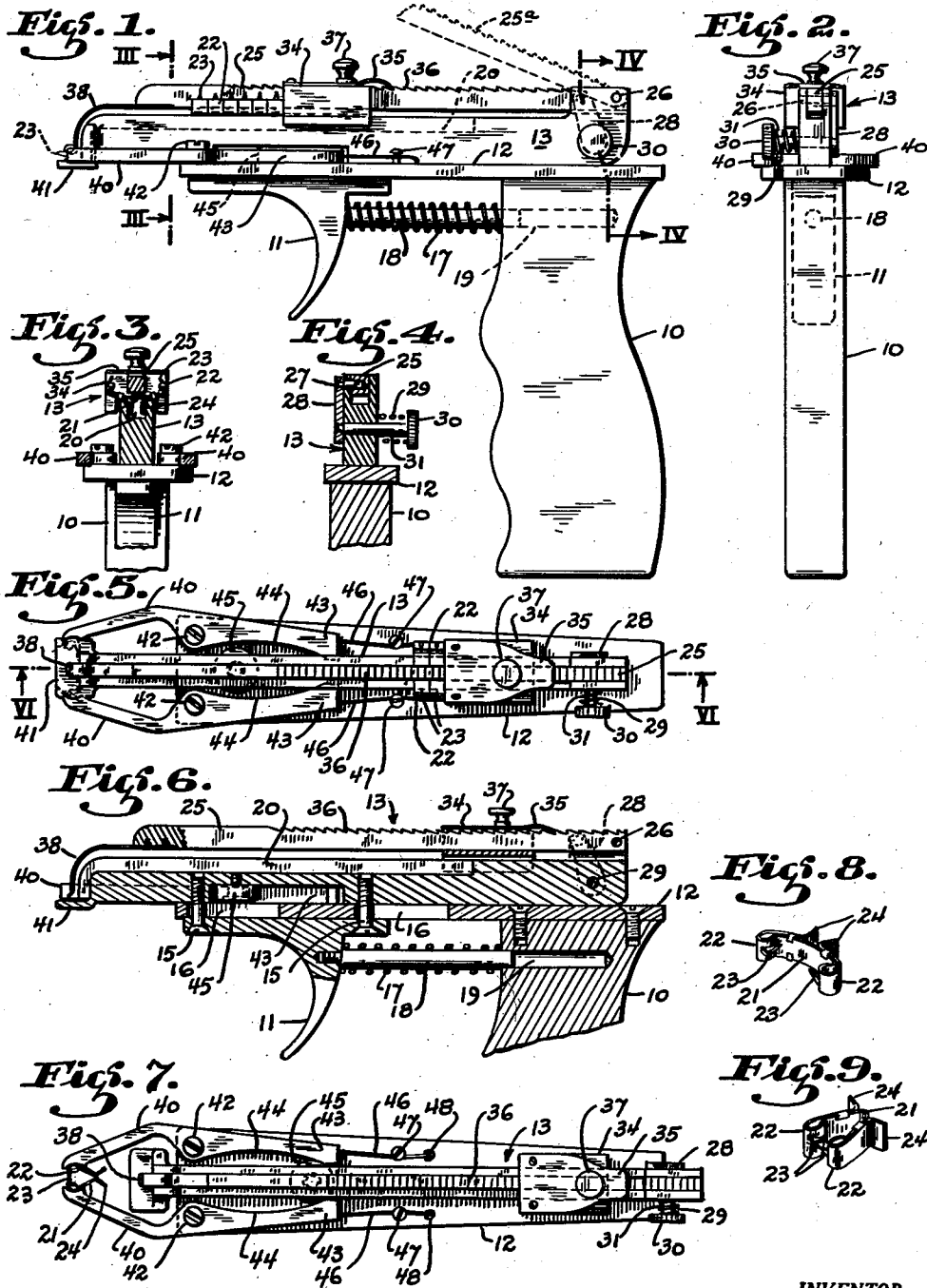
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SURGICAL INSTRUMENT

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SURGICAL INSTRUMENT

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5 Claims. (Cl. 1—49.1)

The present invention relates to surgical instruments and particularly to instruments for handling and applying metallic ligatures.

In surgery, metallic ligatures have, to a great extent replaced the ordinary suture for closing wounds. These ligatures, which consist of small metal clip-like members with flesh-engaging barbs, are bent to assume a position with the barbs engaging the flesh on opposite sides of a wound to draw and hold the edges of the wound in contact with each other to facilitate healing. It is necessary that the clips, and any instrument employed in their application, be sterile, and it is desirable that the clips be handled in a manner to admit of accurate and rapid placement so as not to prolong unnecessarily the time of applying the ligatures.

It is the object of the present invention to provide an instrument for holding and applying metallic ligatures in which they may conveniently be sterilized and by which they may be applied to a wound quickly and conveniently.

A further object is the provision of such an instrument with a pistol-like shape in which the ligatures are contained in a magazine and presented one at a time to a clamping mechanism at the distal end of the instrument, and in which the said clamping mechanism is actuated by a trigger-like member under pressure of one finger of the hand which holds the instrument.

It is also an object of the invention to provide a device of this character of relatively simple construction and in which a supply of metallic ligatures may readily be placed for automatic feeding toward the distal end, and for automatic and positive application.

Further objects and advantages of the invention are made apparent in the following specification, wherein reference is made in detail to the accompanying drawing, in which one form of the invention is illustrated.

In the drawing—

Fig. 1 is a side elevation of a surgical instrument embodying the present invention;

Fig. 2 is a rear end view of the same;

Fig. 3 is a section taken on line III—III of Fig. 1;

Fig. 4 is a section taken on line IV—IV of Fig. 1;

Fig. 5 is a plan view of the instrument shown in Fig. 1;

Fig. 6 is a section taken on the line VI—VI of Fig. 5;

Fig. 7 is a plan view similar to Fig. 5 but with

the parts illustrated in their ligature-closing position;

Fig. 8 is a perspective view of a conventional metallic ligature of a type that may be used in the instrument of this invention; and

Fig. 9 is a perspective view of the same ligature in its closed position.

Referring to the drawing in detail, the instrument is shown as comprising a handle 10 of the pistol-grip type, adapted to be held in the hand with the index finger free to exert pressure on a trigger 11 in the same manner that the trigger of a gun is actuated. The handle 10 supports a forwardly projecting plate 12 on the upper surface of which a magazine 13 is supported for longitudinal sliding movement. The magazine 13 is connected with the trigger 11 by means of screws such as indicated at 15, which screws pass through a pair of slots 16 in the plate 12 and serve with said slots to guide the trigger and magazine for longitudinal sliding movement relative to the plate. A spring 17 engages between the trigger 11 and handle 10 normally to urge the magazine and trigger forwardly, and this spring embraces a pin 18 by which it is guided and which is fixed to the rear edge of the trigger and slidable into a hole 19 bored in the handle 10, as best illustrated in Fig. 6. The magazine 13 consists chiefly of a metal bar, generally rectangular in cross section, and having a slot 20 milled in its upper edge to slidably receive a supply of ligatures.

The manner in which the ligatures are received by the mechanism may best be understood upon reference to Figs. 3 and 8. In Fig. 8 a conventional ligature is shown as being formed of a metal strip 21 bent upon itself to form rounded ends 22 from which barbs 23 project to engage the flesh and draw together the opposite sides of a wound when the ligature is bent to the position indicated in Fig. 9. The ends of the metal strip 21 terminate centrally of the back of the ligature and are bent outwardly to form a pair of wings 24. These wings 24 serve, when the ligature has been bent to the position illustrated in Fig. 9, as a means by which it may be gripped and removed. When the ends 24 are grasped between a pair of forceps or the like and pressed together, they are returned to a position somewhat like that illustrated in Fig. 8, to cause a spreading of the ligature and consequently effect its removal from the flesh after it has served its purpose.

These projecting ends 24 serve, in the instrument of the present invention, to support and

guide the ligature in the magazine, and for this purpose are placed in the slot 20 of the magazine bar 13. When a plurality of ligatures have been placed side by side in the magazine in the position illustrated in Fig. 3, a retaining bar 25, which is pivoted by a pin 26 at the rear end of the magazine, is brought down to overlie the clips, as shown in Fig. 3, and prevents their removal from the magazine while permitting them freely to slide longitudinally thereof. The retaining bar 25 is locked in its closed position by a pin 27 inserted in registering perforations in the bar itself and in one side of the magazine in which the bar is pivoted. This locking pin 27 is carried by a plate 28 fixed to one end of a plunger 29 which slides through the magazine and has an enlarged head 30 at its opposite end. A spring 31 interposed between the head 30 and the magazine 13 normally urges the plunger outwardly, but when it is pressed inwardly against the tension of the spring 31 it effects withdrawal of the locking pin 27, to permit the retaining bar 25 to swing around its pivot 26 to the position illustrated in dotted lines at 25a in Fig. 1.

The arrangement of the locking pin and plunger is such that the head 30 on the plunger is arranged on the right side of the instrument, in a position where it may conveniently be depressed by the thumb of the right hand holding the instrument while the left hand is employed to raise the retaining bar 25 and insert a supply of clips to the magazine.

In order to facilitate feeding of the clips toward the distal end of the magazine, a weight 34 is slidably mounted on the retainer bar 25, and is provided with a trailing spring finger 35 adapted to engage the teeth of a rack 36 cut in the upper edge of the bar 25. The spring is secured to the weight adjacent its rear end, so that it may be lifted out of engagement with the rack 36 when it is desired to move it rearwardly of the bar 25. The tendency of the weight during use of the instrument is to gravitate forwardly, as the instrument is usually held with its distal end in a lowered position. This forward movement of the weight 34 urges the ligatures forwardly, so that the foremost one will always be presented to that portion of the instrument from which it is discharged.

At the extreme forward end of the retainer bar 25 a spring 38 is fixed to extend forwardly and curve downwardly over the rounded forward end of the magazine 13, and thus to guide the ligatures one at a time to a position between the ends of a pair of levers 40, where they are supported and aligned by a plate 41 which is secured to and extends forwardly from the magazine. As the foremost ligature in the magazine passes around the forward curved end thereof, and comes to rest against the plate 41, its outer ends lie between the outer ends of the levers 40, in the position illustrated in Fig. 5, so that upon being brought together these levers will cause a compression of the clip to its flesh-engaging position, which is illustrated in Fig. 9.

The levers 40 are pivoted as by screws 42 to the plate 12, and are provided with tails 43 having opposed inwardly-converging cam surfaces 44. A cam 45, shown as circular in shape, is fixed in a suitable recess in the lower surface of the magazine 13, so that when the magazine is retracted with respect to the plate 12 by pressure on the trigger 11, the cam 45 engages the surfaces 44 on the tails of the levers and moves the forward ends of the levers together, to bend the

ligature into its flesh-engaging position. This same movement of the trigger 11 serves to retract the plate 41 which is supported by the end of the magazine, and thus removes the plate from the position where it supports the ligature, which is then supported entirely by the ends of the levers 40, without obstruction during its bending and application to the wound. The retraction of the magazine also causes the end of the spring 38 to snap over the ligature held between the ends of the levers 40. While the magazine is retracted, the ligatures in it are free to move forwardly under influence of the weight 34, so that the next one will be positioned between the ends of the levers 40 when the magazine is released.

The outer ends of the levers 40 are normally urged apart by a pair of springs 46 (see Fig. 7) which engage their inner ends and are wound on pins 47 and anchored in holes 48 in the plate 12.

With the construction described above, the instrument may be held and operated with the right hand while the left hand is free for use in connection with properly positioning the flesh for reception of the ligatures. Furthermore, the ligatures, which are contained in large number in the magazine of the instrument, may be applied as rapidly as desired, and with the necessity only of imparting pressure to the trigger 11 with the index finger. The shape of the entire instrument is such that it is convenient to handle, and the ligatures may be applied in exactly the position desired and with a rapidity that facilitates the entire operation.

While certain features of the invention have been described in detail for purposes of illustration, it is to be understood that various changes may be resorted to in the construction and arrangement of the several parts, all within the scope of the appended claims.

Having thus described and illustrated my invention, what I claim and desire to secure by Letters Patent is—

1. An instrument for applying surgical ligatures comprising a pair of levers pivotable to engage and bend a ligature, a magazine to contain a plurality of ligatures and present them one at a time to a position between said levers, a pistol-grip handle supporting said levers and magazine, a trigger, and means operable upon compression of the trigger to retract the magazine and pivot said levers.

2. An instrument for applying surgical ligatures comprising a pistol-grip handle, a plate extending forwardly therefrom, a pair of ligature-bending levers pivotally mounted on said plate, a magazine for supplying ligatures to said levers, retractably mounted on said plate, a trigger positioned for compression by the index finger of the hand holding said handle, and means whereby compression of the trigger will effect retraction of said magazine and bending of a ligature between said levers.

3. In an instrument for applying surgical ligatures, a pair of pivoted ligature-bending levers, a magazine to contain and feed ligatures one at a time to a position between said levers, a compressible pistol grip handle member, and means operable upon compression thereof to move the magazine away from the ends of said levers and to pivot them to bend a ligature held between their ends.

4. In an instrument for applying surgical ligatures, an elongated magazine for ligatures, a pair

of ligature bending levers arranged to receive ligatures from one end of the magazine, a handle disposed substantially at right angles to the magazine at its opposite end and adapted to be gripped by one hand, and means operable by the gripping hand to retract the magazine and pivot the levers. 5

extending forwardly therefrom when the handle is gripped in the manner of a pistol, means for supplying ligatures one at a time to and bending them at the forward end of said plate, and means operable by the hand gripping the handle for actuating the supplying and bending means.

5. In an instrument for applying surgical ligatures, a handle, a plate supported thereby and

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