Oct. 31, 1933. C. B. NAGELMANN 1,933,024

SUTURING AND LIGATING INSTRUMENT

Filed Oct. 6, 1931 3 Sheets-Sheet 1

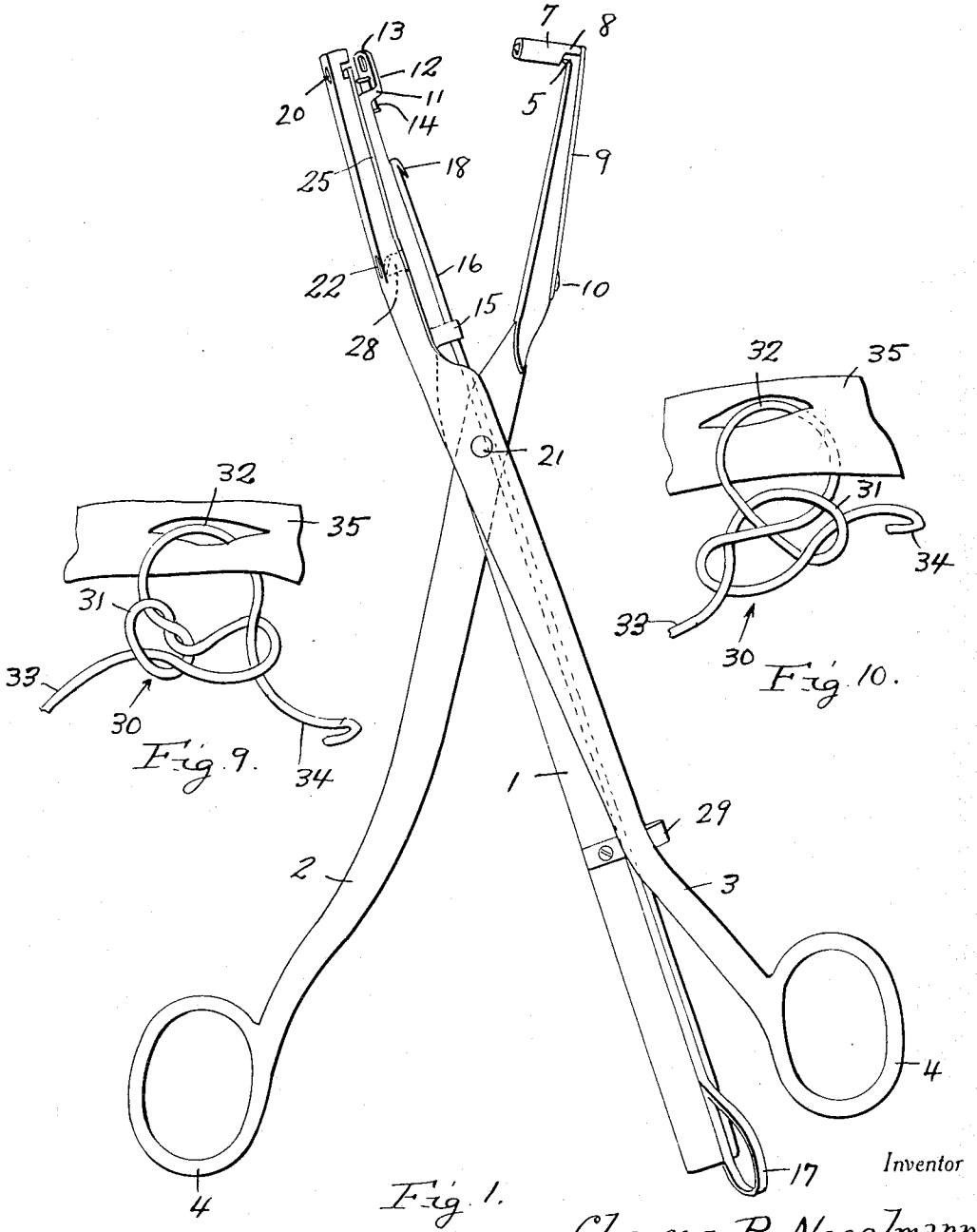


Fig. 1.

Fig. 9.

Fig. 10.

Inventor

Clemens B. Nagelmann

By Clarence A. O'Brien

Attorney

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SUTURING AND LIGATING INSTRUMENT

Filed Oct. 6, 1931 3 Sheets-Sheet 2

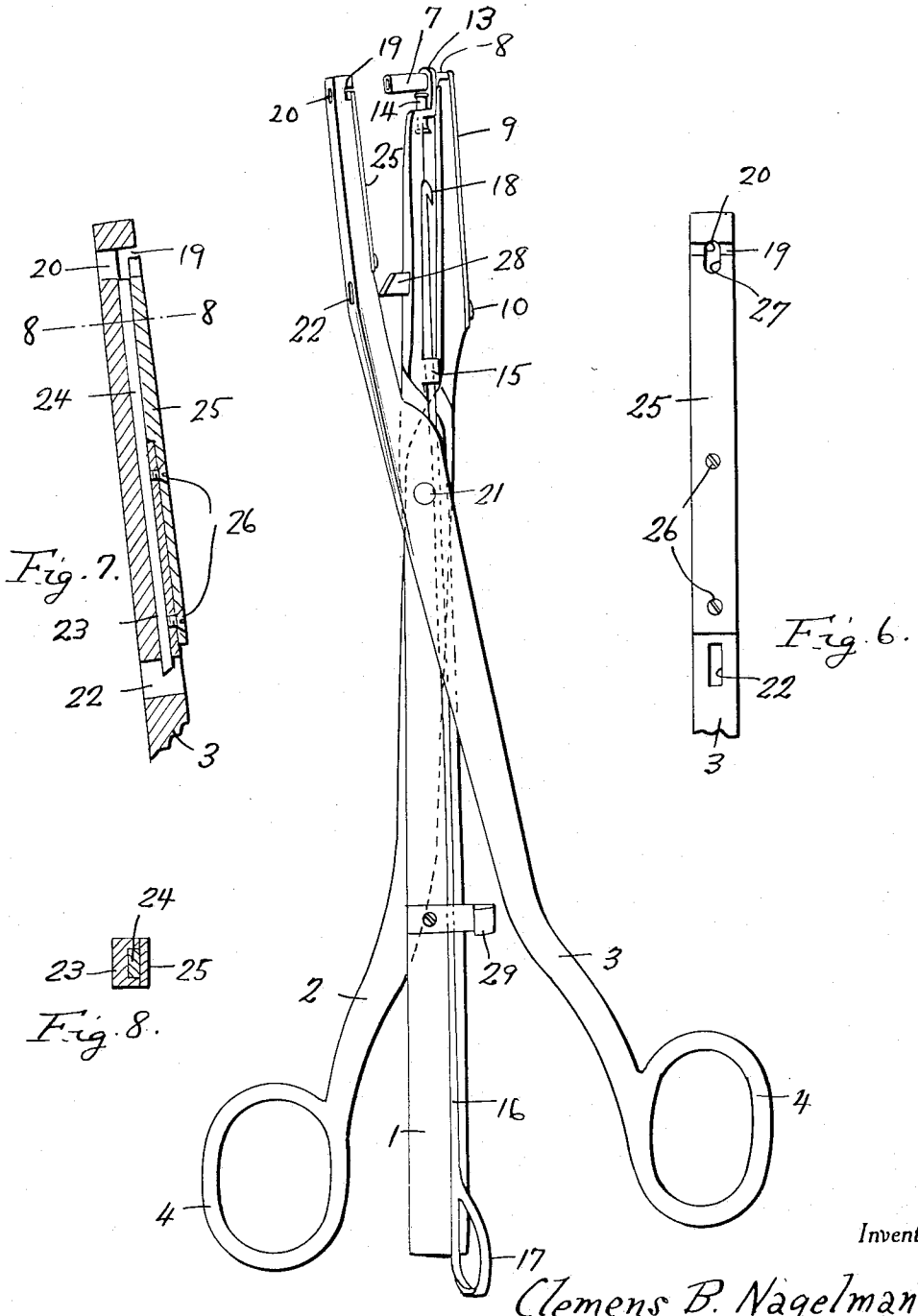


Fig. 2.

Fig. 7.

Fig. 6.

Fig. 8.

Inventor

Clemens B. Nagelmann

By Clarence O'Brien

Attorney

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SUTURING AND LIGATING INSTRUMENT

Filed Oct. 6, 1931 3 Sheets-Sheet 3

Fig. 3.

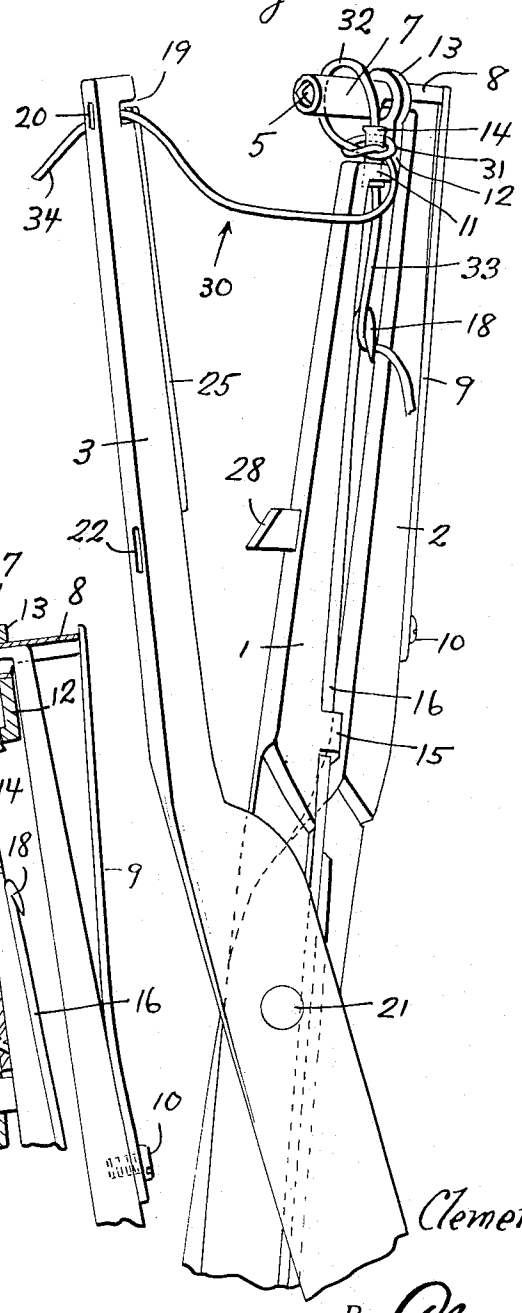


Fig. 5.

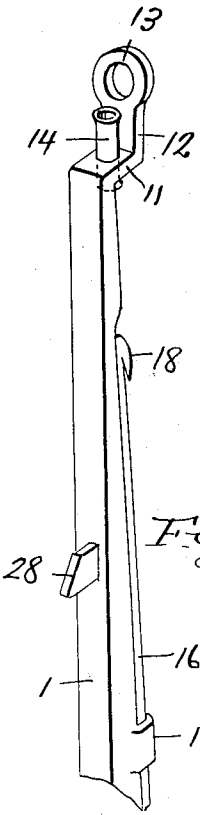


Fig. 4.

Inventor

Clemens B. Nagelmann

By Clarence A. O'Brien

Attorney

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1,933,024

SUTURING AND LIGATING INSTRUMENT

Clemens B. Nagelmann, Santa Barbara, Calif.

Application October 6, 1931. Serial No. 567,279

12 Claims. (Cl. 128—334)

The present invention relates to a suturing and ligating instrument of the general type forming the subject matter of my co-jending application which bears Serial No. 514,223, filed on February 7, 1931, and upon which this invention constitutes an improvement.

An important object of the present invention is to provide, in a manner as hereinafter set forth, a suturing and ligating instrument embodying a novel construction and arrangement of parts through the medium of which a ligature may be expeditiously looped and tied.

Other objects of the invention are to provide a suturing and ligating instrument of the character described which will be simple in construction, strong, durable, efficient and reliable in use and which may be manufactured at low cost.

All of the foregoing and still further objects and advantages of the invention will become apparent from a study of the following specification, taken in connection with the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views, and wherein:—

Figure 1 is a view in side elevation of a suturing and ligating instrument in accordance with the present invention.

Figure 2 is a view in side elevation showing the instrument partially closed.

Figure 3 is an enlarged view of the outer portion of the instrument showing a ligature mounted thereon and ready to be looped about or through the tissue.

Figure 4 is a detail view in perspective showing one end portion of the stripping bar.

Figure 5 is a detail view principally in vertical section through the outer portion of the instrument showing the same in closed position.

Figure 6 is a detail view in elevation of an end portion of one of the levers.

Figure 7 is a view in longitudinal section through a portion of said one lever which is illustrated in Figure 6.

Figure 8 is a cross sectional view taken substantially on the line 8—8 of Figure 7.

Figure 9 is a view showing a ligature which has been partially tied.

Figure 10 is a view showing a ligature in which the tieing operation has proceeded beyond the point shown in Figure 9.

Referring now to the drawings in detail, it will be seen that the instrument constituting the present invention comprises a stripping bar 1 on the opposite sides of which the crossed levers 2 and 3 are mounted for swinging movement. Eyes 4 constituting handles are formed integrally with one end of the levers 2 and 3. At its other end the lever 2 is turned substantially at right angles toward the corresponding end of the lever 3 in a manner to provide a needle 5 which terminates, at its free end, in a hook 6. A substantially tubular housing 7 is slidably mounted on the needle 5 and has formed integrally therewith an extension 8 with which the free end portion of a spring 9 is engaged in a manner to yieldingly urge the housing 7 toward the free end of the needle 5.

At its other end portion the spring 9 is secured to an intermediate portion of the lever 2, as at 10.

The outer end of the stripping bar 1 is provided with a substantially right angularly disposed portion 11 which extends toward the bar 2 and which terminates in a longitudinally extending offset portion 12 having formed integrally therewith a stripping eye 13 through which the tubular housing 7 and the needle 5 are operable. The angular portion 11 of the stripping bar 1 is provided with an opening in which is slidably disposed a tubular sleeve 14 having its end portions flared, as best seen in Figure 5 of the drawings. The purpose of the sleeve 14 will be presently set forth.

The stripping bar 1 is further provided with a guide 15 through which is slidable a rod 16 having a loop 17 constituting a handle on its inner end. The outer end of the rod 16 has thereon a hook 18 for tightening the ligature when the instrument is in use.

On the side thereof which is adjacent the lever 2, the outer end portion of the lever 3 has formed therein an elongated notch or recess 19 with the outer end portion of which a slot 20 in the lever 3 communicates. At an intermediate point the lever 3 is further provided, outwardly of the pivot pin 21, with another slot 22. A passage 23 establishes communication between the slot 22 and the inner end of the elongated notch or recess 19 in the lever 3. A latching bar 24 extends slidably through the passage 23 and has a beveled end disposed in the slot 22. The other end of the bar 24 is disposed immediately adjacent the slot 20. A plate 25 is secured, as at 26, on the lever 3 and is provided with a thickened outer portion extending into the elongated notch or recess 19 for contact with the bar 24. The outer end portion of the plate 25 has formed therein a slot 27 which is aligned with the slot 20 in the lever 3. A cam 28 is mounted laterally on an intermediate portion of the stripping bar 1 for operative engagement with the latching bar 24 for

shifting said latching bar outwardly. The slot 22 in the lever 3 is for the reception of the cam 28.

The reference numeral 29 designates a resilient hook which is mounted on an inner portion of the stripping bar 1 at substantially right angles thereto for engagement with the lever 3 for locking or securing said lever 3 and the stripping bar 1 together, as illustrated to advantage in Figure 1 of the drawings.

A ligature is designated by the reference numeral 30. When the instrument is to be used, an intermediate portion of the ligature 30 is tied in a loop 31 around the sleeve 14. One end portion of the ligature is then looped around the housing 7, as at 32, and threaded through the sleeve 14 and engaged with the hook 18, as at 33. The sleeve 14 is supported in its uppermost position when the ligature is tied thereto. The other end portion 34 of the ligature is inserted transversely through the enlarged upper portion of the elongated slot or recess 19 in the lever 3.

With the ligature left mounted on the instrument, said ligature may be looped and tied to the tissue 35 by swinging the outer end of the lever 3 toward the corresponding ends of the stripping bar 1 and the lever 2. This will cause the needle 5 to pass through the outer portion of the slot or recess 19 and through the slot 20 of the lever 3, said lever 3 engaging the housing 7 and sliding said housing away from the free end of the needle 5 against the tension of the spring 9. As the needle 5 enters the slot 20, the cam 28 enters the slot 22 and engages the bar 24, moving said bar outwardly. It will be noted that the end portion 34 of the ligature 30 is engaged on the outer end of the bar 24. The bar 24 moves the ligature 30 into the path of the hook 6 of the needle when said needle is withdrawn from the slot 20. In this manner the end portion 34 of the ligature is engaged by the needle 5 and drawn into the housing 7 when the levers 2 and 3 are swung apart. Of course, this removes the ligature 30 from the slot or recess 19 in the lever 3. The slot 27 in the plate 25 is for the passage of the needle 5.

When the levers are in the position shown in Figure 5 of the drawings, the hook 29 engages the lever 3 and in this manner the stripping bar 1 and said lever 3 are secured together. Thus, the stripping bar 1 having the eye 13 thereon and the lever 3 remain relatively stationary when the needle 5 is withdrawn from the slot 20 carrying with it the end portion 34 of the ligature 30. Movement of the lever 2 away from the locked together lever 3 and the stripping bar 1 withdraws the housing 7 from the eye 13 with the result that the loop 32 of the ligature 30 is stripped from the housing 7 and now encircles the end portion 34 of said ligature which has been drawn into the housing 7 by the needle 5. It may perhaps be more correct to say that as the lever 2 is swung away from the lever 3 and the stripping bar 1 the spring 9 moves the housing 7 toward the free end of the needle 5 for engagement over the end portion 34 of the ligature 30.

The sleeve 14 is of a diameter to frictionally engage the ligature 30 but to permit sliding movement of said ligature therethrough when force is exerted thereon. After the loop 32 has been stripped from the housing 7 by the stripping eye 13, the rod 16 is slid inwardly and, through the medium of the hook 18, draws the end portion 33 of the ligature inwardly through the sleeve 14 in a manner to restrict or reduce the loop 32 and to slide the sleeve 14 inwardly through the angular portion 11 of the stripping bar 1 by reason of the frictional contact of the ligature with the sleeve. This inward movement of the sleeve 14 strips the loop 31 of the ligature therefrom by engagement of said loop 31 with the outer face of the angular portion 11. Thus, loops and slip knots have been formed which, by continued inward movement of the rod 16, will tighten and tie the ligature about the tissue. It will be noted that after the loop 31 is stripped from the sleeve 14, the end portion 33 of the ligature passes through said loop 31.

It is believed that the many advantages of a suturing and ligating instrument in accordance with the present invention will be readily understood, and although the preferred embodiment of the invention is as illustrated and described, it is to be understood that changes in the details of construction and in the combination and arrangement of parts may be resorted to which will fall within the scope of the invention as claimed.

What is claimed is:—

1. A suturing and ligating instrument comprising a stripping bar, a pair of crossed levers pivotally connected to the stripping bar, a needle on one of the levers, the other lever having an opening for the reception of the needle and for a ligature, and means operable by the stripping bar for operatively engaging the ligature with the needle when said needle is in the opening.

2. A suturing and ligating instrument comprising a stripping bar, a pair of crossed levers pivotally connected to the stripping bar, a needle on one of the levers, the other lever having an opening for the reception of the needle and for a ligature, and means operable by the stripping bar for operatively engaging the ligature with the needle when said needle is in the opening, said means including a bar slidably mounted on said other lever and engageable with the ligature for shifting said ligature into the path of the needle for engagement by said needle as the same is moving out of the opening, and a cam mounted on the stripping bar for operative engagement with the second named bar.

3. A suturing and ligating instrument comprising a stripping bar, a pair of crossed levers pivotally mounted on opposite sides of the stripping bar, a needle on one of the levers, an eye on the stripping bar encircling the needle, the other lever having an opening therein for the reception of the needle and for a ligature, a bar slidably mounted on said other lever for operatively engaging the ligature when the needle is being withdrawn from the opening, a cam on the stripping bar engageable with the second named bar for actuating the same when the stripping bar and said other lever are moved toward each other, and means for locking the stripping bar and said other lever together after they have been moved toward each other.

4. A suturing and ligating instrument comprising a stripping bar, a pair of crossed levers pivotally connected to the stripping bar, said stripping bar having an opening therein, a tubular housing extending slidably through the opening, a needle on one of the levers extending slidably through the housing, resilient means on said one lever engageable with the housing for yieldingly urging the same toward the free end of the needle, said housing adapted to have a ligature looped therearound, the other lever having an opening therein for the reception of the needle and for the ligature, means on said other lever for operatively engaging with the needle as

said needle is withdrawn from the opening in said other lever.

5. A suturing and ligating instrument comprising a stripping bar, a pair of crossed levers pivotally connected to the stripping bar, said stripping bar having an opening therein, a tubular housing extending slidably through the opening, a needle on one of the levers extending slidably through the housing, resilient means on said one lever engageable with the housing for yieldingly urging the same toward the free end of the needle, said housing adapted to have a ligature looped therearound, the other lever having an opening therein for the reception of the needle and for the ligature, means on said other lever for operatively engaging with the needle as said needle is withdrawn from the opening in said other lever, said means including a bar slidably mounted on said other lever, and a cam on the stripping bar operatively engageable with the second named bar for actuating the same when the stripping bar and said other lever are moved toward each other.

6. A suturing and ligating instrument comprising a stripping bar, a pair of crossed levers pivotally connected to the stripping bar, said stripping bar having an opening therein, a tubular housing extending slidably through the opening, a needle on one of the levers extending slidably through the housing, resilient means on said one lever engageable with the housing for yieldingly urging the same toward the free end of the needle, said housing adapted to have a ligature looped therearound, the other lever having an opening therein, means on said other lever for operatively engaging with the needle as said needle is withdrawn from the opening in said other lever, said means including a bar slidably mounted on said other lever, and a cam on the stripping bar operatively engageable with the second named bar for actuating the same when the stripping bar and said other lever are moved toward each other, a sleeve slidably mounted on the stripping bar for disposition through a loop in the ligature and for the passage therethrough of the ligature, and means on the stripping bar engageable with the ligature for restricting the loops therein.

7. A suturing and ligating instrument comprising a stripping bar, a pair of crossed levers pivotally connected to the stripping bar, said stripping bar having an opening therein, a tubular housing extending slidably through the opening, a needle on one of the levers extending slidably through the housing, resilient means on said one lever engageable with the housing for yieldingly urging the same toward the free end of the needle, said housing adapted to have a ligature looped therearound, the other lever having an opening therein, means on said other lever for operatively engaging with the needle as said needle is withdrawn from the opening in said other lever, said means including a bar slidably mounted on said other lever, and a cam on the stripping bar operatively engageable with the second named bar for actuating the same when the stripping bar and said other lever are moved toward each other, a sleeve slidably mounted on a stripping bar for disposition through a loop in the ligature and for the passage therethrough of the ligature, and means on the stripping bar engageable with the ligature for restricting the loops therein, the last named means including a manually operable rod slidably mounted on the stripping bar, and a hook on one end of the rod for engagement with the ligature.

8. A suturing and ligating instrument comprising a pair of pivotally connected levers, a stripping bar pivotally mounted on the levers, and coacting means on the levers and the stripping bar for supporting and tying a ligature, said means including a needle on one of the levers, the other lever having an opening for the reception of the needle, a housing slidably mounted on the needle, means for yieldingly urging the housing in one direction on the needle, and an eye on the stripping bar encircling the housing.

9. A suturing and ligating instrument comprising a pair of levers and a stripping bar and coacting means on the levers and the stripping bar for supporting and tying a ligature, said means including a needle on one of the levers, the other lever having an opening therein for the reception of the needle, a housing slidably mounted on the needle, and an eye on the stripping bar encircling the housing.

10. A suturing and ligating instrument comprising a pair of levers and a stripping bar, coacting means on the levers and the stripping bar for supporting and tying a ligature, said means including a needle on one of the levers, the other lever having an opening therein for the reception of the needle, a housing slidably mounted on the needle, an eye on the stripping bar encircling the housing, and a spring mounted on said one lever and engaged with the housing for yieldingly urging said housing in one direction on the needle, and means for releasably securing the other lever and the stripping bar together against relative movement.

11. A suturing and ligating instrument comprising a pair of pivotally connected levers, a stripping bar pivotally mounted on the levers, and coacting means on the levers and the stripping bar for supporting and tying a ligature, said means including a needle on one of the levers, and a housing slidably mounted on the needle.

12. A suturing and ligating instrument comprising a pair of pivotally connected levers, a stripping bar pivotally mounted on the levers, and coacting means on the levers and the stripping bar for supporting and tying a ligature, said means including a needle on one of the levers, the other lever having an opening therein for the reception of the ligature and for the reception of the needle, a member slidably mounted on said other lever for engaging the ligature with the needle, and a member on the stripping bar engageable with the first named member for actuating said first named member.

CLEMENS B. NAGELMANN.