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2,109,147

ADJUSTABLE ANGLE SURGICAL INSTRUMENT

Filed May 27, 1937

2 Sheets-Sheet 1

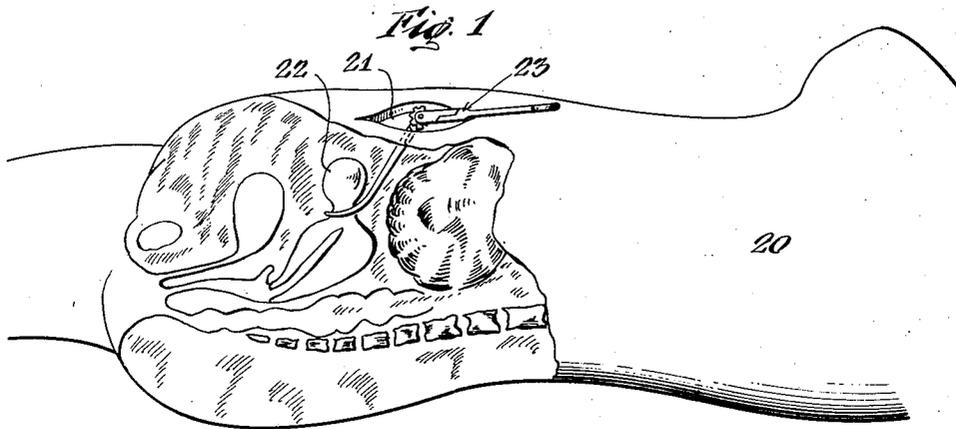


Fig. 2

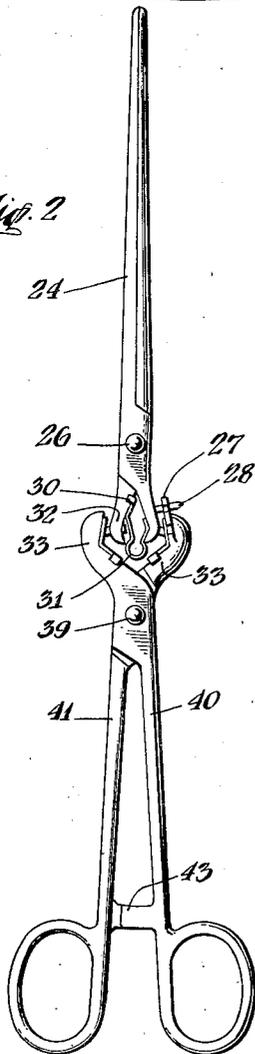


Fig. 3

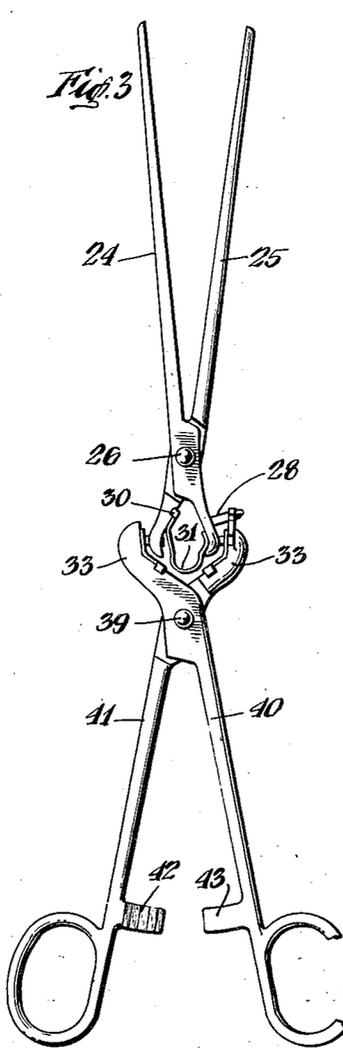
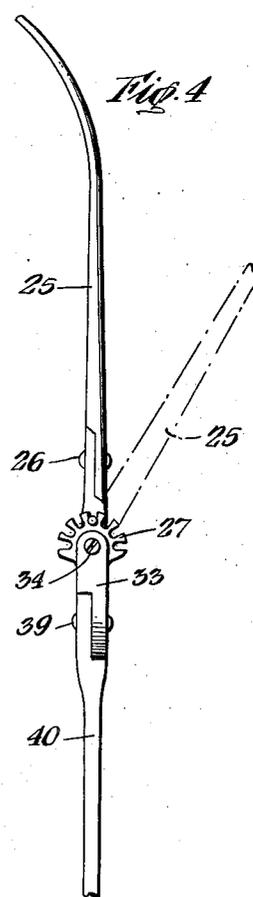


Fig. 4



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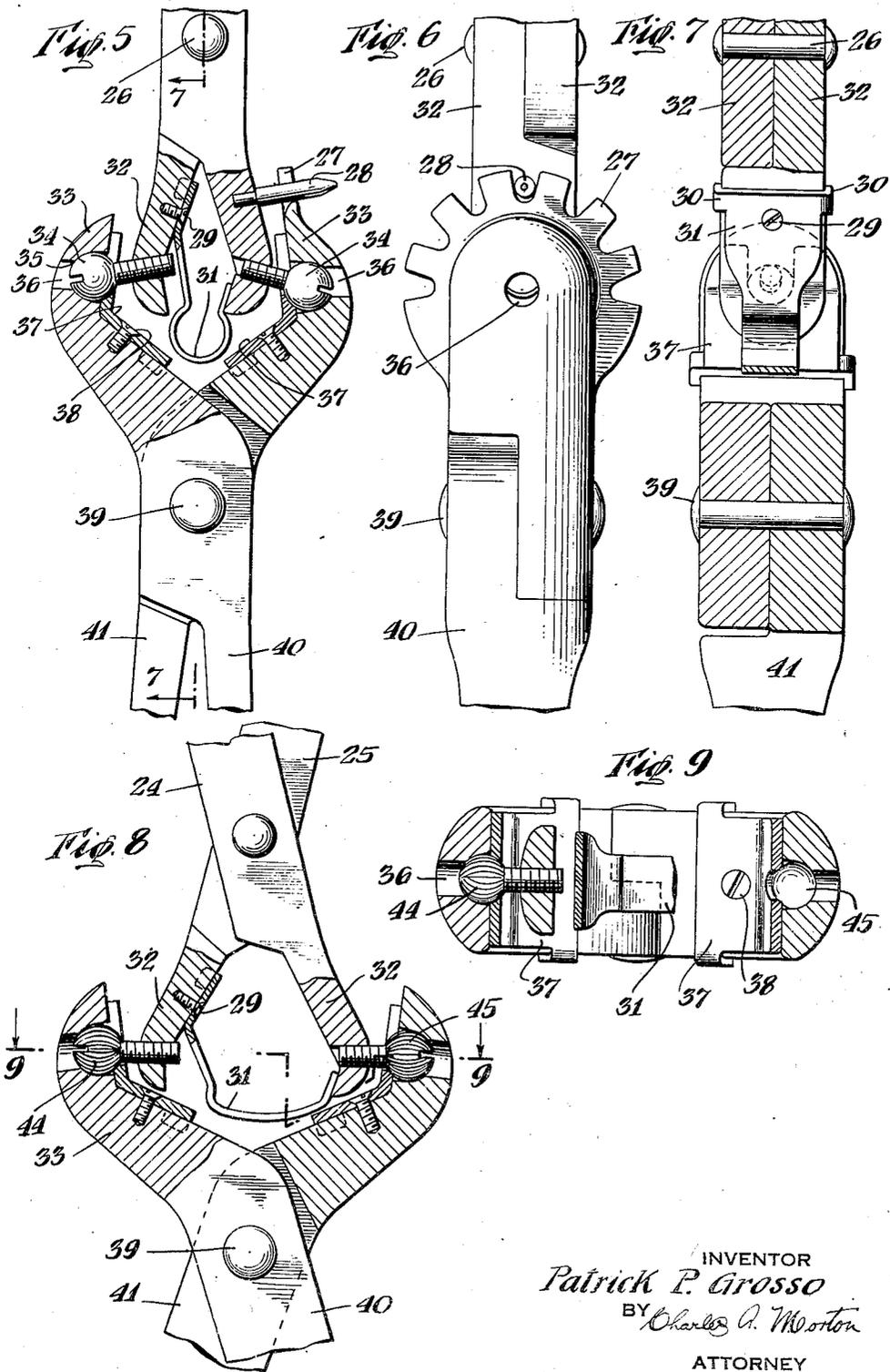
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ADJUSTABLE ANGLE SURGICAL INSTRUMENT

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2 Sheets-Sheet 2



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ADJUSTABLE ANGLE SURGICAL INSTRUMENT

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12 Claims. (Cl. 128—321)

This invention relates to adjustable angle surgical instruments. Although adapted to many general fields of use, it is particularly useful in the fields of surgery, dentistry, and the like.

One object of this invention is to facilitate access to regions which are difficult to reach with ordinary instruments.

Another object is a multi-angle surgical instrument which can be adjusted to different angular positions as circumstances may require.

Another object is to simplify and expedite surgical operations.

Another object is a surgical instrument which can be used without obstructing the field of operation.

Other objects will appear from the detailed description which follows.

In the drawings comprising two sheets of nine figures numbered Figs. 1 to 9 inclusive:

Fig. 1 is a view of a torso partially broken away to show one adaptation of my adjustable angle surgical instrument used as a grasping instrument.

Fig. 2 is a front view illustrative of one form of surgical instrument embodying my invention.

Fig. 3 is a view of the said instrument in open position.

Fig. 4 is a side view of the instrument.

Fig. 5 is a front view of a portion of the mechanism with certain of the parts shown in section.

Fig. 6 is a side view of the device of Fig. 5.

Fig. 7 is a vertical sectional view taken along the line 7—7 of Figure 5 looking in the direction of the arrows.

Fig. 8 is a front view of a modified form showing certain of the parts in section; and

Fig. 9 is a horizontal cross section taken along the line 9—9 of Figure 8 looking in the direction of the arrows.

Like reference characters designate corresponding parts throughout the several figures of the drawings.

Referring to Fig. 1 an incision 21 has been made in a torso 20, and an instrument 23 embodying my invention adjusted to the desired angle, has been inserted through said incision to grasp and retain the organ 22 in fixed position. It should be observed that the instrument 23 has been so adjusted, that the handles thereof are supported upon the torso without obstructing the field of operation.

Referring to Figs. 2 to 4 inclusive, instrument 23 includes the operating jaws 24 and 25, of (merely by way of illustration) a grasping, holding or clamping instrument, such as a pair of

forceps or the like. The particular form of jaws employed forms no part of this invention, any other form of jaws may be substituted in the instrument 23 dependent upon the particular use intended. As a surgical instrument the device has particular reference to all forms and kinds of grasping, holding, carrying, crushing, cutting or clamping instruments, such as forceps, clamps, hemostats, tenaculums, ronguers, carriers, scissors, and some of the special instruments such as gall bladder forceps, intestinal forceps, and nose and throat instruments. The device may also be applied to dental and veterinarian instruments.

Jaws 24 and 25 are pivoted at 26, and beyond said pivot terminate in a pair of short arms 32. Each arm 32 is drilled and tapped to receive the threaded shank of a ball headed screw 34 (Fig. 5). The ball headed screws 34—34 are mounted in the ball sockets 35—35 of the lever arms 33—33 of the handle members 41—40, (compare Figs. 2 and 5). The ball screws 34—34 are retained in their associated ball sockets by the plates 37—37 which are secured to the lever arms 33—33 by means of the plate screws 38—38. The ball and socket connections between the arms 32—32 and the lever arms 33—33, afford means for effecting angular adjustment between operating jaws 24—25 and handles 41—40. Handle members 41—40 are pivotally mounted at 39.

To lock operating jaws 24—25 at any selected angle relative to handles 40—41, one lever arm 33 is provided with a notched plate 27 (Figs. 4 and 6), and the associated arm 32 is provided with a locking pin 28 adapted to engage in the various notches of notched plate 27. To facilitate centering of pin 28 in plate 27, the pin may be tapered, and the notches of plate 27 may be bevelled (see Fig. 5). The jaws 24—25 close against the increased tension of the hook shaped spring 31. Spring 31 is held in position upon the arm 32 by screw 29, and said spring is provided with ears 30—30 engaging around the front and rear walls of the arms 32—32 to prevent lateral movement of the spring. Each lever arm 33 is provided with an opening 36 to permit the insertion of a screw-driver or like article in the notched ball headed screw 34, so that the several parts can be easily mounted and adjusted. Handle members 40—41 are provided with spur ratchet bars 42—43 which engage as the handle members 40—41 are moved from the open position (Fig. 3) towards the closed position (Fig. 2), to adjustably lock operating jaws 24 and 25 by way of arms 32—32, lever arms 33—33,

and handle members 40—41 in the closed, grasping, holding or clamping position shown in Figs. 1 and 2.

To adjust instrument 23 to any desired angle, the handle members 41—40 are moved apart (Fig. 3), until locking pin 28 disengages notched plate 27; operating jaws 24—25 are now turned about the universal joint formed by ball headed screws 34—34 and their associated ball sockets 35—35 to any desired angle (as for example, the position indicated in dotted outline in Fig. 4), whereupon the handle members 41—40 are moved inwards against the increased tension of hook spring 31, until tapered locking pin 28 re-engages in one of the bevelled notches of notched plate 27, thereby locking jaw members 24 and 25 at the selected angle relative to lever arms 33—33 and handle members 41—40. The number of angular settings will be governed by the number of notches provided in notched plate 27. Notched plate 27 and locking pin 28 illustrate one convenient form of angle setting and locking device. Many alternative forms of angle setting and locking device will occur to those skilled in the art.

In the modified form illustrated in Figs. 8 and 9 locking pin 28 and notched plate 27 are dispensed with, and knurled ball screws 44—45 are substituted for the ball headed screws 34—34 of the device of Fig. 5. With this construction with handle members 40—41 in open position the operating jaws 24—25 are turned to the desired angle about the universal joint formed by knurled screws 44—45 and their associated ball sockets. Applying slight gripping pressure on the handle members 40 and 41, causes the knurled surfaces of the ball screws to frictionally engage the walls of their associated sockets to lock the arms 32—32 relative to the lever arms 33—33 at the desired angle.

The use of this multi-angle instrument will facilitate many surgical procedures, especially where structures, organs, tissues, blood vessels, or nerves, are difficult to reach with ordinary instruments. Its use likewise eliminates delay and expedites operative procedure in cases where a fixed angle instrument has not been sterilized, and is therefore not available for immediate use when unexpectedly needed. This multi-angle instrument is also a great advantage in those cases where the surgeon requires an instrument having a particular angle for picking up a structure, and an instrument having an entirely different angle for holding the structure while the operative procedure is completed. In such circumstances my multi-angle instrument is invaluable because the angle of the instrument can be changed immediately and the handle members 41—40 moved to that position which eliminates obstruction of (or least obstructs) the surgeon's field of operation.

What is claimed is:

1. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; and means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and the plane of said jaw members comprising pivotal connections between said lever arms and said short arms.

2. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and the plane of said jaw members comprising pivotal connections between said lever arms and said short arms; and means for locking said lever arms to said short arms at a predetermined angle without impairing the control of said jaw members from said handle members.

3. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and the plane of said jaw members comprising pivotal connections between said lever arms and said short arms; and means, associated with said handle members, operable to lock said jaw members in closed position.

4. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and the plane of said jaw members comprising pivotal connections between said lever arms and said short arms; and spur ratchet bars mounted on said handle members, said ratchet bars co-acting to lock said jaw members in closed position.

5. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and said jaw members comprising ball and socket connections between said lever arms and said short arms; means for locking said lever arms to said short arms at a predetermined angle without impairing the control of said jaw members from said handle members; and means, associated with said handle members, operable to lock said jaw members in closed position.

6. In a device of the character described and in combination, a pair of handle members, a piv-

otal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and the plane of said jaw members comprising pivotal connections between said lever arms and said short arms; means for locking said lever arms to said short arms at a predetermined angle without impairing the control of said jaw members from said handle members, and spur ratchet bars mounted on said handle members, said ratchet bars coacting to lock said jaw members in closed position.

7. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms, a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms, a spring co-acting with said short arms to separate said jaw members, and means for controlling the closing movement of said jaw members from said handle members against the increased tension of said spring and for permitting independent angular movement between said handle members and said jaw members comprising ball and socket connections between said short arms and said lever arms.

8. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms, a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms, one of said short arms including a notched plate, ball and socket connections between said lever arms and said short arms, and means, associated with one of said lever arms, for engaging any one of the notches in said plate to lock said jaw members at any selected angle to said handle members.

9. In a device of the character described and in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connections to form a pair of lever arms, a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms, one of said short arms including a plate having a plurality of peripheral bevelled notches therein, a spring co-acting with said

short arms to separate said jaw members, means for controlling the closing movement of said jaw members from said handle members against the increased tension of said spring and for permitting independent angular movement between said handle members and said jaw members comprising ball and socket connections between said short arms and said lever arms, and a tapered pin mounted on one of said lever arms for engaging any notch in said plate to lock said jaw members at any angle to said handle members.

10. In a device of the character described, the combination with a pair of handle members pivoted to open and close in a given plane, and a pair of jaw members separately pivoted to open and close in the plane and under the control of the handle members, of means comprising ball and socket connections for mounting said jaw members upon said handle members to control the opening and closing movement of the jaw members from the handle members and to permit angular movement of the jaw members into and out of the plane of the handle members, and of means operable to lock the jaw members to the handle members in any selected plane.

11. An adjustable angle surgical instrument comprising in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; and means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and said jaw members comprising ball and socket connections between said lever arms and said short arms.

12. An adjustable angle surgical instrument comprising in combination, a pair of handle members, a pivotal connection therebetween, the ends of said handle members extending beyond said pivotal connection to form a pair of lever arms; a pair of jaw members, a pivotal connection therebetween, the ends of said jaw members extending beyond said pivotal connection to form a pair of short arms; and means for controlling the opening and closing movement of said jaw members from said handle members and for permitting relative angular movement between said handle members and said jaw members comprising protuberances extending laterally outwards from said short arms defining ball connections, recesses in said lever arms defining socket connections for said ball connections, and detachable means for retaining said ball connections in said socket recesses.

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