Feb. 23, 1932. H. N. STEVENSON 1,846,573

SURGICAL INSTRUMENT

Filed March 4, 1931

Fig. 1.

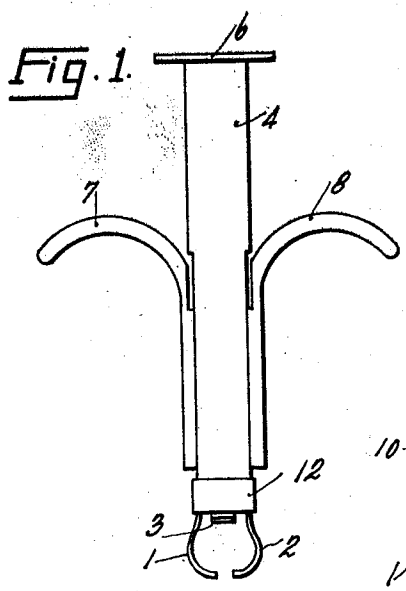


Fig. 2.

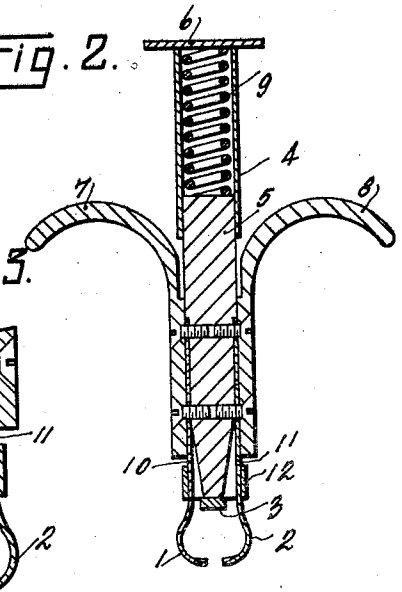


Fig. 3.

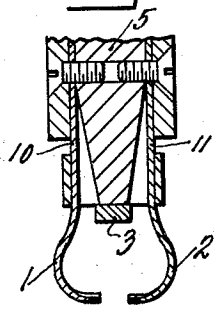


Fig. 4.

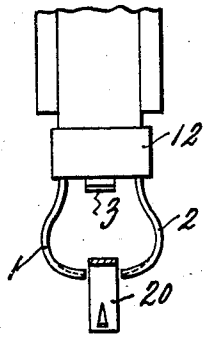


Fig. 5.

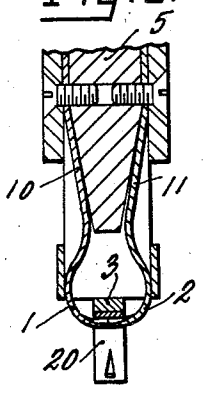


Fig. 6.

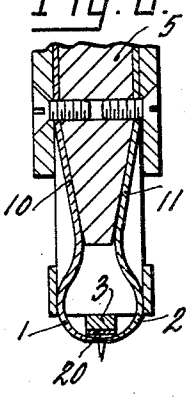


Fig. 7.

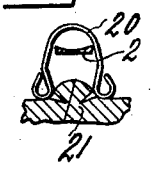
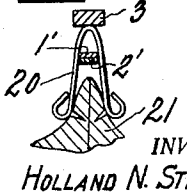


Fig. 8.



Fig. 9.



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UNITED STATES PATENT OFFICE

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SURGICAL INSTRUMENT

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This invention relates to an improved surgical instrument for a special purpose. In many operations the surgeon who formerly closed an incision by stitches now closes it by a series of separate metal clips or clamps. These clamps are applied and removed one by one. They have the distinct advantage over stitches in that they are easier to apply. Such a clamp, now in rather wide use, consists of a flat and narrow metal strip with each end rolled back to make a bead-like edge. Adjacent each bead edge is a small sharp prong and the metal strip between and on the same side as the prongs is slightly concave. When the bead edges are pushed toward one another by a suitable tool, the strip between the edges bends upwardly, so that the ends bending inwardly bring the edges of the incision together with a gentle pinching action, while the prongs are pushed in the flesh to hook the strip in that position. The metal is or may be of a German silver composition which will normally retain the shape to which the tool bends it. Various tools have been available for both applying those clamps and removing them.

The special purpose of my invention is to provide an improved tool for removing such clamps from the wound, so as to do such work quickly and minimize the pain and annoyance for the patient. The structure of the improved tool in a preferred form and its principles of operation will be made clear from the accompanying drawings and the specific description.

In the drawings—

Fig. 1 is a front elevation of the tool;

Fig. 2 is a longitudinal section through the assembled tool showing the frame, the spring, the gripper or tweezers, the anvil, and the hand hold portions of the tool all assembled for operation;

Fig. 3 is a detail view showing the shape of the preferred surface-engaging portions of the gripper or tweezer fingers and anvil for giving an extra spread to the surgical clamp in opening it for removal;

Figs. 4, 5, and 6 are detail views showing respectively the initial position of the tool ready to grip the clamp, the position to which the anvil is moved relatively to the clamp before the pressure between gripper fingers and anvil start to bend the clamp for removal, and the final position of these parts after the clamp is bent by the tool and is ready for the final removal step;

Fig. 7 is a somewhat conventional view of the clamp in functioning position on a wound before the tool has operated;

Fig. 8 is a view of the clamp relative to the wound after the clamp is bent by the tool for final removal; and

Fig. 9 is a detail modification.

In considering the description it should be kept in mind that my main object is to provide a tool that will remove the clamp from the wound by a manipulation for avoiding pain to the patient. While the speed and facility of operation for the surgeon is important, the movements of the tool in a way to do the work in a gentle manner is the controlling object. The specific tool shown was conceived as a means for removing clamps from incisions in operations for mastoiditis, where the incision is behind the ear and the clamps are hard to manipulate in the removal operation. This specific use illustrates one of very many uses for the tool after dangerous operations when the patient is most sensitive.

I will first describe the movements that I want the tool to accomplish relatively to the clamp, and then the specific means shown by way of a preferred form, to secure such movements. I desire to move the gripper or tweezer fingers 1 and 2 so that they underlie the metal strip of the clamp, one gripper finger 1 underlying the clamp from one side and the other finger 2 from the opposite side. In such movement I desire to avoid any movement of the clamp itself as by bending it, except in such cases as the mere positioning of the fingers under the clamp may require it to bend a little. To best accomplish this the end portions of the fingers are thin enough, arranged in the same plane, and are not wide enough in their preferred form to disturb the ordinary bend in the clamp. Thus, the gripper fingers 1 and 2 move to position with no work to do in the movement except to get in position.

As this is accomplished I desire to have the

anvil 3 brought into contact with the clamp on the upper side or opposite to the side where the gripper fingers have been brought to place. When the parts are thus arranged, I desire the gripper fingers to remain stationary and the anvil 3 to move straight down against the bend of the clamp strip and flatten it out by direct and normal pressure between the gripper fingers and the anvil. In this flattening action the movement of the anvil 3 while the fingers remain stationary is an important feature as it gives the least opportunity for a relative undesired movement between the clamp and the sensitive and healing wound. The desired movement is to directly spread the ends of the clamp without tipping the clamp and without pushing the clamp toward or pulling it to disturb the wound. The sole movement theoretically desired is the spreading movement of the clamp ends so as to remove the prongs in a straight line and in a gentle manner. The flattening of the clamp at its humped central portion will do this, where the central portion can be gripped and flattened without accompanying movements of any injurious kind, as by tipping, pushing, or pulling relatively to the wound. One or two refinements will be pointed out in the tool which are designed to increase the movement for the ends of the clamp to spread out.

These desired movements are accomplished with the structure shown. The frame of the tool 4 has a socket where a compression spring 9 acts to resist upward movement of the plunger or upper portion of the tweezers. On top of the frame is a thumb rest 6 and attached to each side of the plunger are finger grips 7 and 8. At the sides of plunger 5 are downwardly extending leaf springs 10 and 11 which terminate in the gripper fingers 1 and 2, respectively, to form tweezers. A collar 12 around the lower end of the frame is arranged to slide up and down so as to move leaf springs 10 and 11 in and out. Thus, the gripper fingers 1 and 2 are moved in and out. Between the springs 10 and 11 is the anvil 3 mounted on and movable with the frame. The anvil 3 is a part of the frame 4, either integral therewith or fastened thereon. A convenient way to form the frame 4 is out of tubular sheet metal providing vertical and opposite slots below the recess for spring 9. This permits a convenient attachment and the movement of finger grips 7 and 8 with plunger 5. At the bottom of the sheet metal frame 4 the collar 12 is fastened on or may be formed integral with frame 4. The anvil 3, frame 4, and collar 12 can all move together and with respect to plunger 5 or the latter can move with respect to anvil, frame, and collar, depending on whether the finger grips are held stationary and the frame 4 moved or the frame held stationary and the finger grips moved. The preferred movement is for the tweezer fingers on the plunger 5 to be placed as in Fig. 4 and then holding the finger grips 7 and 8 stationary for the frame 4, collar 12, and anvil 3 to be moved downwardly for the action as in Figs. 5 and 6, all as described.

With this construction, a holding pressure on the finger grips 7 and 8, a downward pressure on the thumb rest 6 will press the frame downwardly against the spring 9. In this movement the collar 12 will press leaf springs 10 and 11 inwardly, bring the gripper fingers 1 and 2 together in the same plane at the bottom, and bring the anvil 3 into pressure position immediately above the horizontally positioned gripper fingers 1 and 2 and in line for direct pressure between the gripper fingers and anvil.

The surgeon first locates the gripper fingers in a plane just under the bend of the clamp 20, as in Fig. 4, presses down on the thumb rest 6 while keeping the finger grips 7 and 8 stationary until he has the clamp contacted by the tool for bending the clamp ends outwardly as in Fig. 5. The structural principles of the tool permit the clamp to be supported on each side edge and underneath between the clamp and the wound. With the clamp thus firmly supported the anvil is firmly pressed down by the thumb while the gripper fingers are held stationary as in Fig. 6. This bends the clamp ends outwardly with a very gentle motion.

Sometimes the bend in the clamp is such that the ends will not ordinarily spread far enough apart to release the prongs upon one operation of the tool. One way to increase the spread is to apply the tool successively to two portions of the bent strip. But I prefer, as far as possible, to apply the tool once, at as near the central portion of the bent clamp 20 as I can. By providing a slight knob or convexity on the anvil 3 and a slight concavity in the upper faces of the gripper fingers, as indicated in the form shown, I can increase the spreading action in unbending the clamp. By pressing the anvil down as far as permitted, a portion of the clamp will be pushed into the concavity and the slight reverse curve thus caused will tend to spread and lift the ends of the clamp. This final movement indicated in Fig. 6 is a refinement and is of advantage in getting the prongs well out of the patient at the end of the clamp spreading action. When the prongs are removed the clamp is taken away with the tool.

It will be seen that the surgeon with the improved tool can easily and steadily locate it for operation, even in difficult places, as behind the ear, and with about the same facility as he could locate tweezers of the ordinary kind. His operation of the tool in its preferred form can take place without any long leverage movements from an angle as has been customary with the former scissor-like tools. The latter cause movements of the clamp-engaging end against the clamp 20 and

wound 21 and really necessitate a fumbling around, at much pain and annoyance to the patient before the clamp is properly grasped for removal. While with the improved tool there is no ordinary necessity for fumbling around at all, but instead the tool can engage the clamp very easily and unbend it in a gentle manner. My tool first contacts or grasps the clamp firmly without bending it and the unbending action begins after the clamp has been so firmly grasped that its further action is necessarily dominated by the unbending action alone.

A surgeon's operating conditions vary so much that I desire to point out some variations in the described tool. What is desired for the exact movements in one preferred embodiment, as in the one described, may not be desired for slightly different conditions. For example, in Fig. 9 I have shown a clamp 20 in a different condition than that shown in Fig. 7. The bend is at such an acute angle and flesh is crowded up into the bend so closely that the tweezer fingers 1 and 2 would not enter within the bend. In such a case I modify the preferred form of tool shown in the drawings and make my tweezer fingers to a preferred form for the particular purpose disclosed in Fig. 9. In such a case I make the ends of my tweezer fingers tapered at the sides. I offset the ends so that one may slide over the other. In the operation indicated in Fig. 9 the preferred movements would be for the anvil 3 to contact with the top of the clamp 20 just as the tapered sides of overlapped tweezer ends 1 and 2 started to pry the sides of the clamp 20 apart. As the tweezer ends are pushed further together, the anvil would continue to descend and there would be a three-point support during the unbending of the clamp. This would cause the least possible disturbance to the flesh.

By varying the curves at the sides of the arms 1 and 2 (see Fig. 3) and varying the shape and relative positions of the tweezer ends where they enter sidewise under the clamp 20 it is clear that a great variety of operating conditions can be accommodated. For this reason it is not to be supposed that the one tool I have shown for purposes of disclosing my invention is the only specific form in which the invention is useful. And all of this will be fully understood by the skilled man in the art. While there is some advantage under proper conditions for bringing the tweezer ends together by such a collar as 12 sliding downwardly on the tweezer arms, such arms can be brought together in various other ways, as by leverages, screws, or pulleys and wires. I merely mention these things to make it clear that the tweezer-anvil arrangement is one of the broadest features of my invention apart from the choice of particular ways to manipulate such parts.

Having disclosed my invention, what I claim is:

1. A surgeon's tool for the purpose described comprising tweezer fingers having end portions turned into substantially the same plane and normally apart, a pusher member slidable up and down on the tweezer fingers and provided with an anvil part to overlie the said end portions and exert pressure between such portions and the anvil, means having finger holds to operate the pusher member.

2. A surgeon's tool for the purpose described comprising tweezer fingers having end portions turned in substantially the same plane and having an upper concave surface in that plane, a pusher member slidable up and down adjacent the tweezer fingers and provided with an anvil part having a convex surface to overlie said concave surface, means having finger holds to operate the pusher member and exert pressure between the concave surface of the tweezer ends and the convex surface of the anvil.

3. A surgeon's tool for the purpose described comprising tweezers having the ends bent inwardly and normally separated in substantially the same plane so as to extend under from the sides and be brought together to firmly underlie a binding strip, a frame slidable on the tweezers and having parts to force said tweezer ends together during a sliding movement, an anvil portion on said frame adapted to move into pressure position with said ends when the latter are together, finger grips on said tweezers and frame whereby the anvil and tweezer ends may be brought into pressure-exerting positions with respect to the piece to be grasped and pressed by the tool.

4. A surgeon's tool for flattening bent metal strips such as are used as substitutes for wound stitches, said tool comprising tweezers having ends bent to straddle the strip and when brought together to underlie the bent strip for supporting it from the sides and bottom, an anvil having a carrying frame slidable along the length of the tweezers to position the anvil against the strip from above and press it for unbending against the tweezers' support, all arranged for the tweezers' support to be gently applied between the strip and the wound and for the anvil to press the strip for straightening and removing it while avoiding other movements on the strip.

5. A surgeon's tweezers having gripping ends bent inwardly to underlie the work to be gripped, a presser member slidably mounted to force the work against the upper surface of the said bent ends, said tweezers and presser member having finger holds for relative manipulation, all combined to serve as

a tool for gently removing bent metal strips such as are used as substitutes for wound stitches.

6. A surgeon's tool comprising tweezers and an anvil, means to manipulate the ends of the tweezers at a distance therefrom and to press the anvil and tweezer ends together for a coordinated action to unbend a surgical clamp when located between the tweezer ends and anvil.

7. A surgeon's tool comprising tweezers having end portions bent so as to come together in an overlapping and common supporting plane, the sides of said ends being tapered, an anvil arranged to overlie said plane and means to exert pressure between the tweezer ends and anvil.

In testimony whereof I have affixed my signature.

HOLLAND N. STEVENSON.