

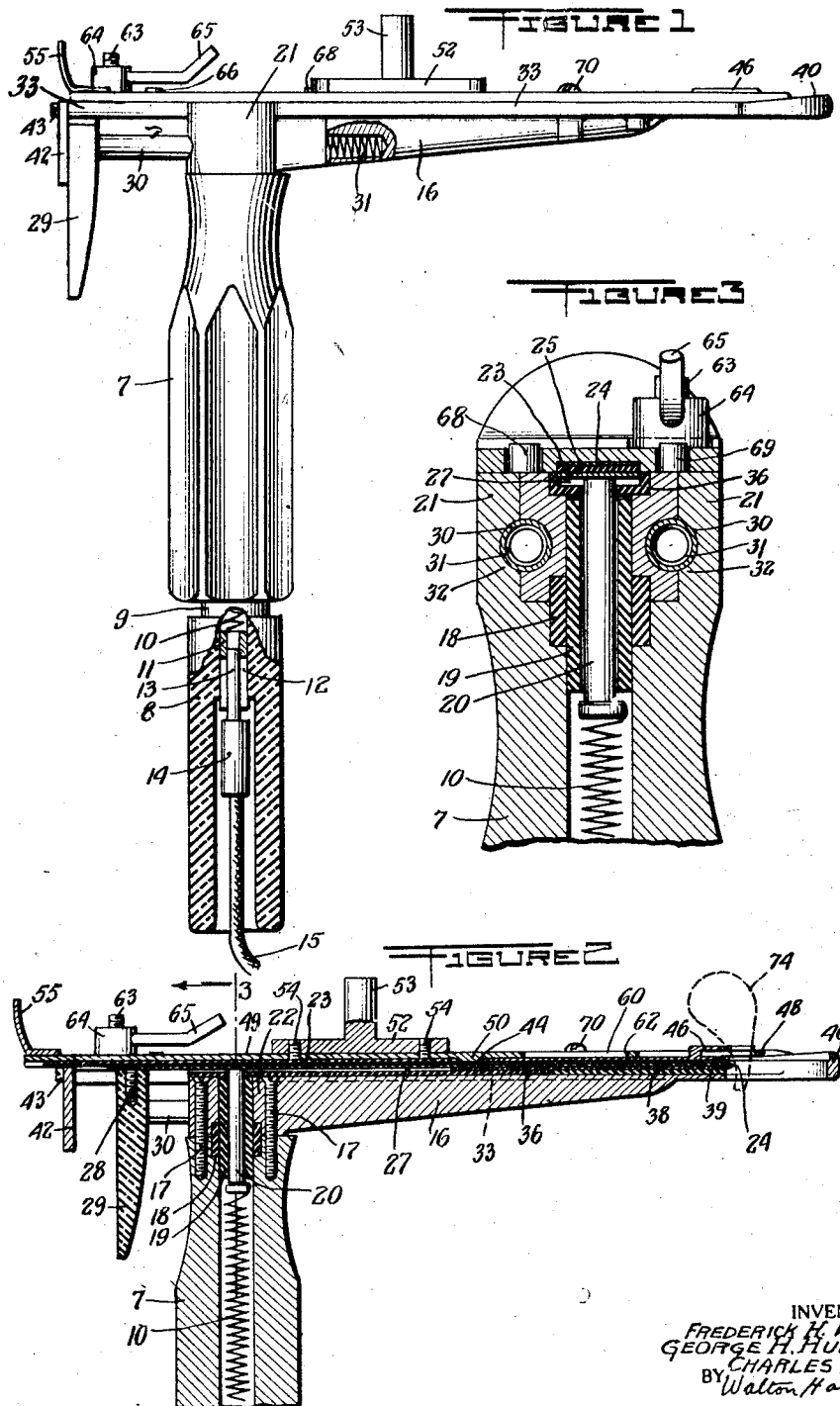
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F. H. WAPPLER ET AL
ELECTROSURGICAL INSTRUMENT

Filed Sept. 11, 1925

2 Sheets-Sheet 1



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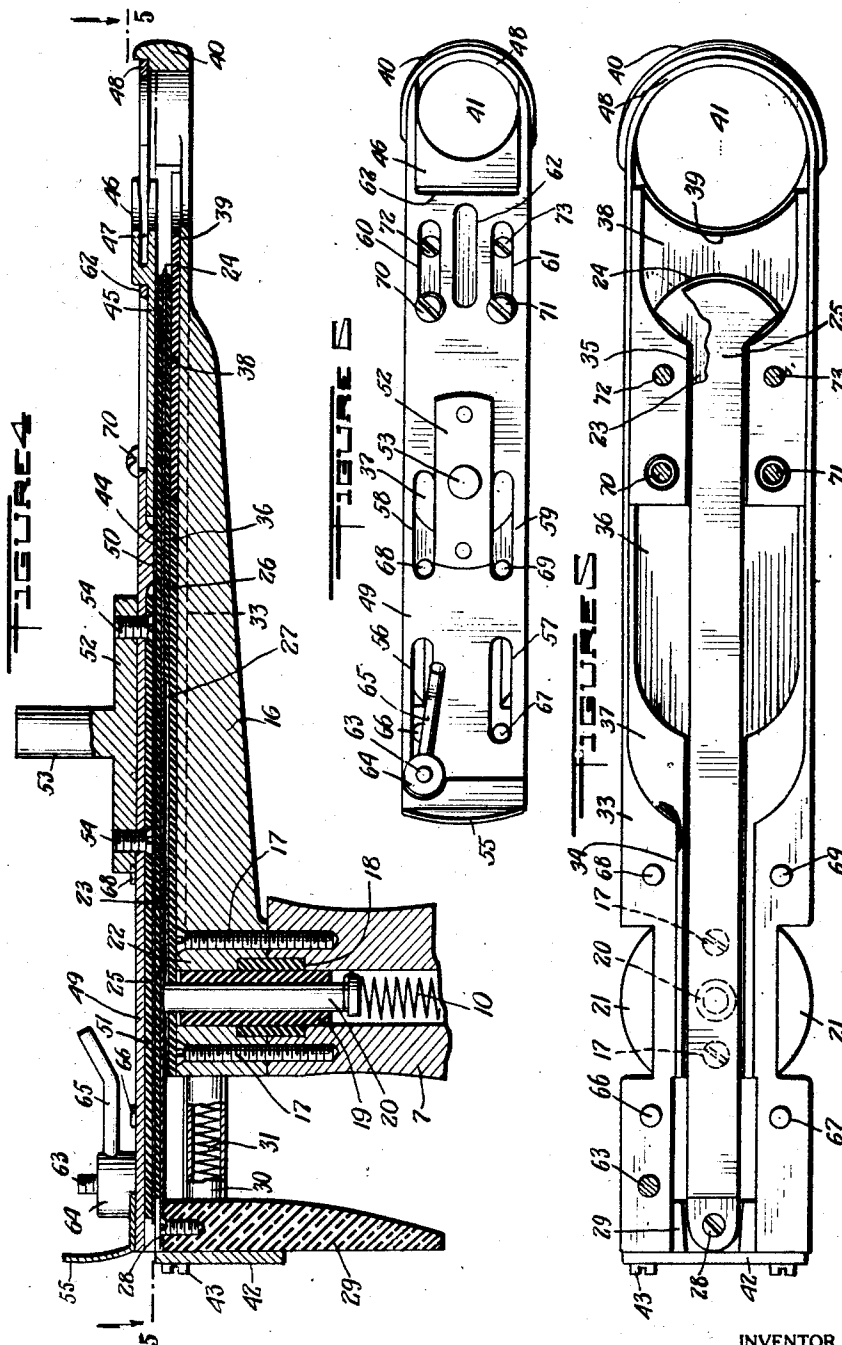
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ELECTROSURGICAL INSTRUMENT.

Application filed September 11, 1925. Serial No. 55,655.

Our invention relates to electro-surgical instruments of the type in which cutting operations are performed by means of an electrically energized blade in such manner that the tissues are severed by means of oscillating currents instead of by means of sharp blades.

More particularly stated we seek to produce an electro-surgical instrument of the general type above designated and admitting of general use, but specially adapted for removing tonsils and analogous organs, usually of small size or for removing parts thereof, the operation being performed without loss of blood and the wound being small and having the character of a coagulated surface rather than a burn or cut.

However, our invention is not in all instances dependent upon the use of oscillatory currents, and as occasion may require may be used with alternating currents of relatively low voltage and low frequency, or even with direct currents. Hence our device may be employed for ordinary surgical cutting in which there is little or no coagulation.

One form of apparatus, well adapted for producing oscillatory currents appropriate for use with our invention, is described in a pending application by Charles Fayer, Serial No. 730,359, filed August 6, 1924.

An important point which we seek to accomplish by our invention is to provide the instrument with a loop and an electrically energized cutting member, these parts being so formed and arranged that the loop may be operated to seize and hold a tonsil or other organ, and the electrically energized cutting member then moved relatively to the loop so as to cut off the organ or some part thereof.

By this arrangement the organ to be operated upon is not displaced or distorted to any great extent until actually severed, and because of this fact the cutting can be done with great accuracy and by a quick movement, without chance of damaging any tissues except those intended to be severed.

Our invention further comprehends various improvements in electro-surgical instruments of the type here contemplated.

Reference is made to the accompanying drawings forming a part of this specification,

and in which like reference characters indicate like parts throughout all of the figures.

Figure 1 is a side view, partly in elevation and partly in section, showing our improved electro-surgical instrument.

Figure 2 is a substantially central vertical section through the mechanism appearing in Figure 1.

Figure 3 is a section on the line 3 of Figure 2, looking in the direction indicated by the arrows.

Figure 4 is an enlarged section, otherwise similar to Figure 2.

Figure 5 is a section on the line 5—5 of Figure 4, looking in the direction indicated by the arrows.

Figure 6 is a plan view of our device.

A handle 7 is made of metal and has a general form more or less tubular, as may be understood from Figures 1 and 2.

A tubular insulator 8 is provided with a neck portion 9, which is detachably fitted into the adjacent portion of the handle 7.

A spiral spring 10, made of conducting material, preferably metal, extends through the handle 7, and presses against a contact collar 11 carried by the tubular insulator 8. The contact collar 11 is provided with slots 12, or in other words has the form of a partially split cylinder, such as is commonly used in this art for purposes of making electrical contacts. Detachably fitted into this contact collar 11 is a contact pin 13, forming a part of the cord tip 14, the latter being connected with the cord conductor 15, whereby currents are supplied for energizing certain parts of our device, as hereinafter more fully described.

The handle 7 carries a head 16, secured upon it by means of screws 17. A ring 18 of insulating material, shown more particularly in Figure 4, extends partly into the top of the handle 7 and into the adjacent portion of the head 16, thus serving to some extent as a dowel, for holding these parts accurately in position. Extending through the ring 18 of insulating material is a sleeve 19, also of insulating material. This sleeve extends practically through the head 16, and also ex-

tends well down into the adjacent portion of the handle 7, thus serving as an additional dowel as well as for purposes of insulation.

A contact pin 20 extends through the sleeve 19 of insulating material, which thus acts as a bearing for this contact pin. The spring 10 also exerts a gentle pressure against the contact pin 20 and this pin fits neatly but loosely within the sleeve 19.

The handle 7 carries a pair of lugs 21, each integral with it and of arcuate form, as may be understood from Figures 1 and 5. These lugs fit upon opposite sides of the head 16, the portion immediately adjacent the lugs being cut away for this purpose. In other words, the head 16 is mutilated to fit into the lugs 21, thus increasing the mechanical strength of the framework of the device.

A slide electrode is shown at 23 and has the general form of a thin, flat bar and is arranged to be moved back and forth in the direction of the length of such bar. The slide electrode 23 is at one of its ends provided with an operating surface 24 of arcuate form, as may be understood from Figure 5. The slide electrode is further provided with a top facing 25 and with a bottom facing 26 of enamel, these two facings each extending throughout nearly the full length of the bar of the slide electrode, and each at one of its ends being shorter than the operating edge 24 of the slide electrode, as may be understood from Figures 4 and 5. That is to say, the slide electrode 23 is insulated throughout practically its entire length, but its operating edge 24 protrudes slightly out from between the facings of the enamel, and thus exposes a metallic edge having the general arcuate form indicated for it in Figure 5.

The facing 26 of enamel extends only about one-half the length of the slide electrode, and this leaves a slot 27 as indicated in Figure 4. By this arrangement the contact pin 20, pressed by the spring 10, makes a good electrical contact with the adjacent portion of the slide electrode, the latter being movable back and forth in the direction of its length so that the contact pin is always in engagement with it.

For the purpose of enabling the operator to move the slide electrode 23 as just mentioned, it is secured by a screw 28 to a thumb piece 29, as indicated more particularly in Figure 4. This thumb piece 29 is mounted upon a pair of tubular guides 30, through which extend spiral springs 31, these springs and the tubular guides 30 being fitted telescopically into openings 32, as indicated in Figure 3. The springs 31 by their pressure tend to force the thumb piece 29 to the limit of its travel to the left according to Figure 4, and the tubular guides 30 serve to guide this thumb piece in a predetermined path. By

this arrangement, when the thumb piece 29 is pressed to the right according to Figure 4 the spring 31 is compressed, and when the pressure of the thumb is relaxed the pressure of the spring 31 restores the thumb piece to the limit of its travel to the left according to Figure 4, or in other words to its normal position when not in use.

The head 16 is provided with a rather wide and thin portion 33, of the form indicated more particularly in Figure 5, this portion being provided with grooves 34, 35 of the shape indicated in this figure.

The portion 33 carries a plate 36 of insulating material, preferably hard rubber, having a thick portion 37 and fitting neatly into the groove 34. This plate 36 of insulating material serves to still further insulate the slide electrode 23 and parts immediately associated therewith. Another plate 38, also of insulating material, fits end to end against the plate 36, and extends therefrom to the right according to Figure 4. This plate 38 at its end to the right according to this figure, has a curved edge, the curvature of which is concaved and approximates a semicircle.

The head 16 carries a portion 40 provided with a circular opening 41 and thus formed into an eye, as may be understood from Figure 5. The head 16, at its end to the left according to Figures 4 and 5, also carries a stop plate 42, secured upon it by a screw 43.

A strip of insulating material 44 is secured to a guide plate 45, provided with a guide fork 46, having a slot 47, the guide plate 45 and the strip 44 being secured in position as hereinafter more fully described.

A loop 48 is slidably mounted upon the portion 40 of the head 16, and is carried by, and in this instance integral with, a loop plate 49 shown more particularly in Figure 4.

The loop plate 49 carries a plate 51 of insulating material and also carries a handle piece 52, the latter being provided with a lug 53, serving as a handle whereby the loop plate may be slidably operated. Screws 54 each extend through the plate 51 of insulating material and through the adjacent portion of the loop plate 49 into the handle plate 52, so as to hold these parts rigidly together as indicated in Figure 4. The loop plate 49 carries at its end to the left according to Figure 4 a thumb rest 55, against which the operator presses his thumb in order to cause the loop plate to slide in a direction to the right according to Figure 4. In order to cause the loop plate to move in the opposite direction, the operator grasps the handle 53 and moves it to the left according to this figure.

The loop plate 50 is provided with a number of slots 56, 57, 58, 59, 60, 61, 62, as shown more particularly in Figure 6. The slot 56

is a little longer than the other slots mentioned. Extending through the slot 56 is a screw 63, and revolvably mounted upon this screw is a clamping nut 64, provided with an arm 65 whereby this nut may be turned. The purpose of the clamping nut 64 is to clamp the loop plate 50 into different positions of adjustment into which it may be moved from time to time.

The loop plate is guided in its sliding movements by a number of guiding pins 66, 67, 68, 69, which extend through the slots 56, 57, 58, 59, and by a pair of screws 70 and 71 which extend through the slots 60 and 61.

By means of a pair of screws 72 and 73, which are sunken into the guide plate 45 and extend downwardly through it and through the strip 44 of insulating material, these two last mentioned parts are held rigidly in position, with the parts occupying positions indicated for them in Figure 6. The loop plate 49 is movable, and is normally locked in position by the clamping nut 64. The operator by grasping the arm 65 and turning the clamping nut 64 slightly, can loosen the loop plate 49. This done, the operator can grasp the lug 53 with one hand the large handle 7 with the other, and can slide the loop plate 49 slightly to the left according to Figure 6, to an extent permitted by the length of the various slots 57, 58, 59, 60 and 61. Having brought the loop plate into the required position the operator, by now turning the nut 64 in the opposite direction, can clamp the loop plate 49 in its new position. Since the loop plate 49 carries with it the loop 48, this loop can be brought into any desired position over the circular opening 41, through which the tonsil or other gland or part thereof is to be extended, as hereinafter more fully described. This may be understood from Figure 2, in which a tonsil is shown by dotted lines at 74.

It may be noted in this connection that the guide fork 46, being stationary in relation to the head 16 and framework generally, occupies a fixed position relatively to the portion 40 of the head 16. This means that the loop 48 may, by adjustment of the loop plate 49 as above described be brought into any desired position between the guide fork 46 and the semicircular portion 40 of the head 16. Thus it is an easy matter to clamp the stem of the tonsil 74 in between the guide fork 46 and the loop 48, so as to hold the tonsil firmly. This done, the operating surface 24 of the slide electrode 23 is in close proximity to the stem of the tonsil, held as just described. It follows that the operator by holding the handle 7 and placing his thumb upon the thumb-piece 29 and pressing upon the latter, can force the slide electrode 23 to the right according to Figure 2, and cause its operating edge to press directly against the stem of the tonsil.

The slide electrode is cold while in action.

It is energized by a special oscillating cutting current and a circuit may be traced as follows: conducting cord 15, cord tip 14, contact pin 13 of same, contact collar 11, metallic spring 10, contact pin 20, slide electrode 23 passing from operating surface 24 to tonsil or other part to be cut, thence through the human body to the ground, back to source of electrical supply, not shown, thence back to conducting cord 15.

The actual physical contact made by bringing the operating surface 24 against the part of the organ to be cut completes the circuit just traced, and causes the slide electrode 23 to do its cutting. The insulation carried by the slide electrode, and all other insulation in immediate proximity to the same, must be quite thorough in order to avoid short circuiting.

The operation of our device is as follows:

The parts being assembled and arranged as above described and as illustrated in the drawings, and the cord conductor 15 being connected with a suitable supply of electric current, either direct or alternating, the device is ready for use.

In order to remove a tonsil or other small organ or a part thereof the operator grasps the arm 65 of the clamping nut 64, and by turning the nut slightly, loosens it. He then so manipulates the instrument as to bring the portion 40 of the head 16 upon the side of the tonsil, the guide fork 46 being at the opposite side thereof. Then grasping the handle 53 and by its aid moving the loop plate 59 as above described he brings the loop 48 tightly up against the stem of the tonsil 74 as indicated in Figure 2. This done, he turns the clamping nut 64 by means of the arm 65, and thus secures the loop plate rigidly in position. The neck of the tonsil is thus held between the loop plate 48 and the guide fork 46, these two parts being now quite close together.

The operator next places his thumb upon the thumb piece 29, and by pressing upon it moves the slide electrode 23 to the right according to Figure 3, the operating edge 24 being pressed against the neck of the tonsil. The slide electrode being energized as above stated by electric currents, the operating edge 24 makes its cut and thus severs part to be removed.

When a tonsil or analogous organ or part thereof is removed with this instrument, no blood is shed and the resulting wound is of a different character from a wound made by one or more sharp blades.

We do not limit ourselves to the precise mechanism here shown, as variations may be made therein without departing from our invention, the scope of which is commensurate with our claims.

We claim:

1. In an electro-surgical instrument the combination of a head provided with an open-

ing, a guide fork mounted upon said head and partially bounding said opening, a loop plate slidably mounted upon said head and carrying a loop extending across said opening, said loop plate being adjustable relatively to said head so as to adjust said loop relatively to said opening in order to grasp an organ or the like, a slide electrode carried by said head and movable relatively thereto, said slide electrode being provided with an operating surface disposed adjacent said opening for the purpose of severing said organ or some anatomical part holding the same, and means for electrically energizing said slide electrode.

2. An electro-surgical instrument comprising a head provided with a groove, a slide electrode extending through said groove and slidable relatively to said head, said slide electrode being provided with an operating surface, means for energizing said slide electrode in order to render said operating surface effective for cutting, mechanism carried by said head for grasping an organ or other anatomical part located within the path of travel of said operating surface of said slide electrode, and means for electrically energizing said slide electrode.

3. An electro-surgical instrument comprising a head provided with a groove, a slide electrode carried by said head and slidably mounted within said groove, mechanism connected with said slide electrode and controllable by the operator for actuating said slide electrode, loop mechanism carried by said head for grasping and holding an organ or the like in position to be operated upon by said loop electrode, means for enabling the operator to adjust said loop mechanism, and electrical connections for energizing said slide electrode.

4. An electro-surgical instrument comprising a head provided with an eye, a guide fork mounted upon said head and located in a fixed position relatively to said eye, a loop carried by said head and movable relatively to said guide fork and coacting therewith for grasping a tonsil or other anatomical part, an electrode slidably mounted upon said head and insulated therefrom, said electrode being provided with an operating surface movable relatively to said guide fork and said loop, and electrical connections for energizing said slide electrode in order to enable said operating surface thereof to make a cut.

5. An electro-surgical instrument comprising a head provided with a groove and with a guide fork, a loop movably mounted upon said head and disposed adjacent said guide fork and coacting therewith for the purpose of grasping a tonsil or the like, a slide electrode mounted within said groove of said head and insulated from said head, said slide electrode being movable relatively to said guide fork and said loop, means for electrical-

ly energizing said slide electrode in order to enable said slide electrode to cut, and a thumb piece mounted upon said slide electrode and movable relatively to said head for enabling the operator to actuate said slide electrode.

6. An electro-surgical instrument comprising a head provided with an opening, a guide fork mounted upon said head and partially bounding said opening, a loop plate mounted upon said head and movable bodily in relation thereto for purposes of adjusting said loop plate relatively to said head, means controllable by the operator for locking said loop plate in fixed position relatively to said head, a loop carried by said loop plate and adjustable relatively to said guide fork for the purpose of grasping a tonsil or other anatomical part, a slide electrode carried by said head and movable relatively to said guide fork for the purpose of cutting said tonsil or other anatomical part, a contact member engaging said slide electrode for supplying electric current thereto in order to electrically energize said slide electrode, and means for supplying said electric current to said contact member.

7. A cutting electrode comprising a handle, a head mounted upon said handle and provided with an opening, a guide fork mounted upon said head and partially bounding said opening, a loop carried by said head and movable relatively to said guide fork for the purpose of grasping a tonsil or other anatomical part, mechanism carried by said head for adjusting said loop relatively to said guide fork and for locking said loop in different positions of adjustment, a slide electrode carried by said head and insulated therefrom, a thumb piece carried by said slide electrode for enabling the operator to actuate said slide electrode, guiding members connected with said thumb piece and with said head for guiding said thumb piece and said slide electrode relatively to said head, and means for supplying electric current to said sliding electrode in order to energize said slide electrode.

8. The combination of a handle, a head carried upon said handle, loop mechanism carried by said head for grasping a tonsil or other anatomical part, mechanism including a thumb rest connected with said loop mechanism for enabling the operator to actuate said loop mechanism, a slide electrode mounted upon said head and movable relative to said loop mechanism for the purpose of severing said tonsil or other anatomical member, a thumb piece carried by said slide electrode to enable the operator to actuate said slide electrode, and electric connections for supplying electric current to said slide electrode in order to electrically energize said slide electrode.

9. The combination of a handle, a head mounted upon said handle and provided with an opening, a loop plate mounted upon said head and adjustable relatively thereto, means

for guiding said loop plate relatively to said head, locking mechanism for holding said loop plate rigidly in relation to said head, a slide electrode mounted upon said head and movable relatively thereto, said slide electrode being insulated from said head, a thumb piece carried by said slide electrode for enabling the operator to move said slide electrode relatively to said head, and a contact member engaging said slide electrode for the purpose of supplying electric current thereto.

10. The combination of a handle, a head carried thereby and provided with an eye, a loop carried by said head and movable relatively to said eye for the purpose of grasping a tonsil or other anatomical member, a loop plate carrying said loop, means for adjusting said loop plate in different positions relatively to said head in order to actuate said loop, an electrode carried by said head and movable relatively thereto for the purpose of severing said tonsil or other anatomical member, and

means for electrically energizing said electrode.

11. An electro-surgical instrument comprising a handle, a head mounted upon said handle and provided with an opening, a loop plate carried by said head and adjustable relatively to said opening, a loop carried by said loop plate and coacting with a boundary of said opening for grasping a tonsil or other anatomical part, a slide electrode carried by said head and having the form of a long bar, said slide electrode being movable in the direction of its length and provided at one of its ends with an operating surface disposed adjacent said opening, means for enabling the operator to move said slide electrode in the direction of its length, and electrical connections for supplying current to said slide electrode in order to energize said slide electrode.

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