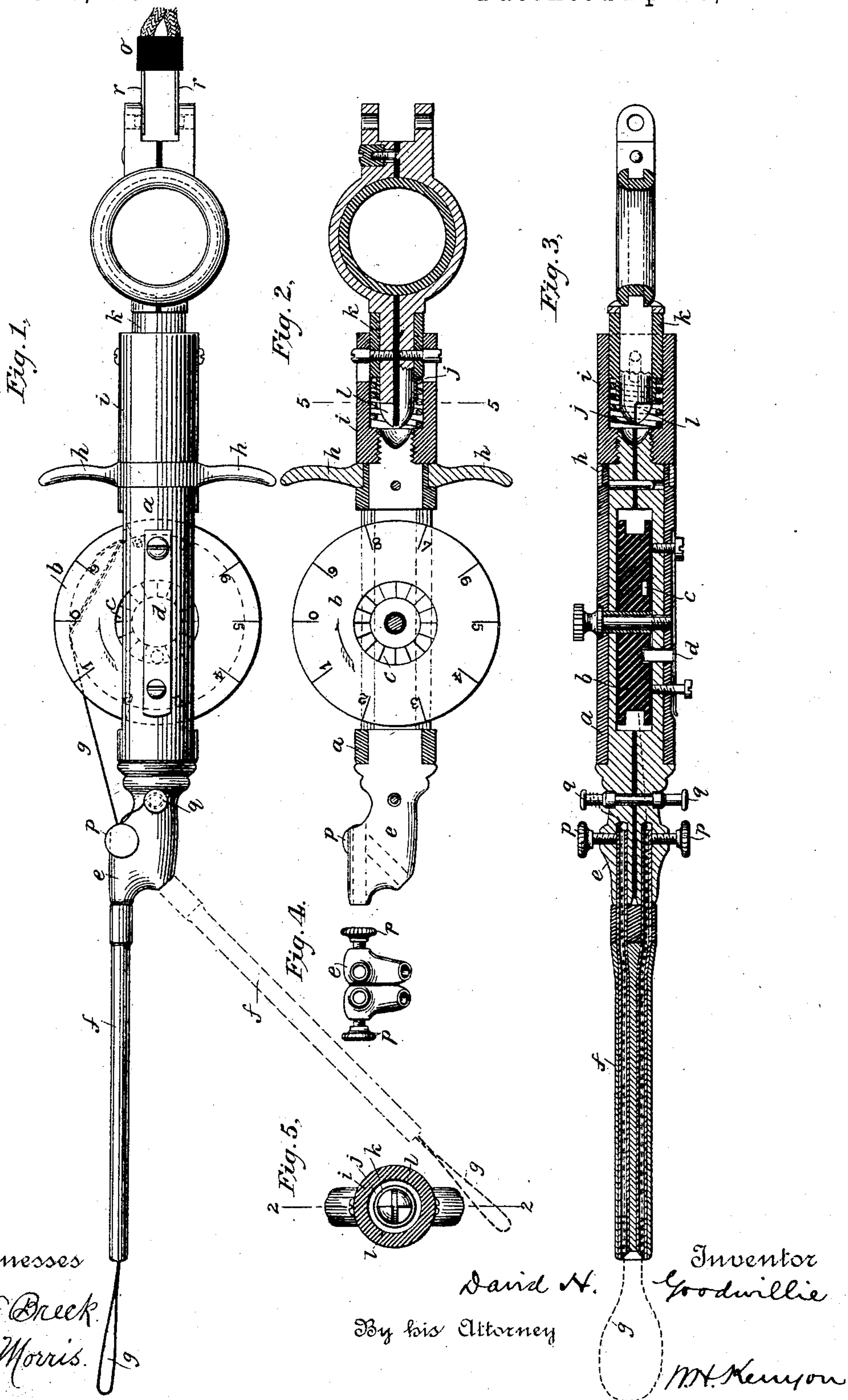


D. H. GOODWILLIE.

ELECTRO CAUTERY INSTRUMENT FOR USE IN SURGERY.

No. 360,429.

Patented Apr. 5, 1887.



Witnesses
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(No Model.)

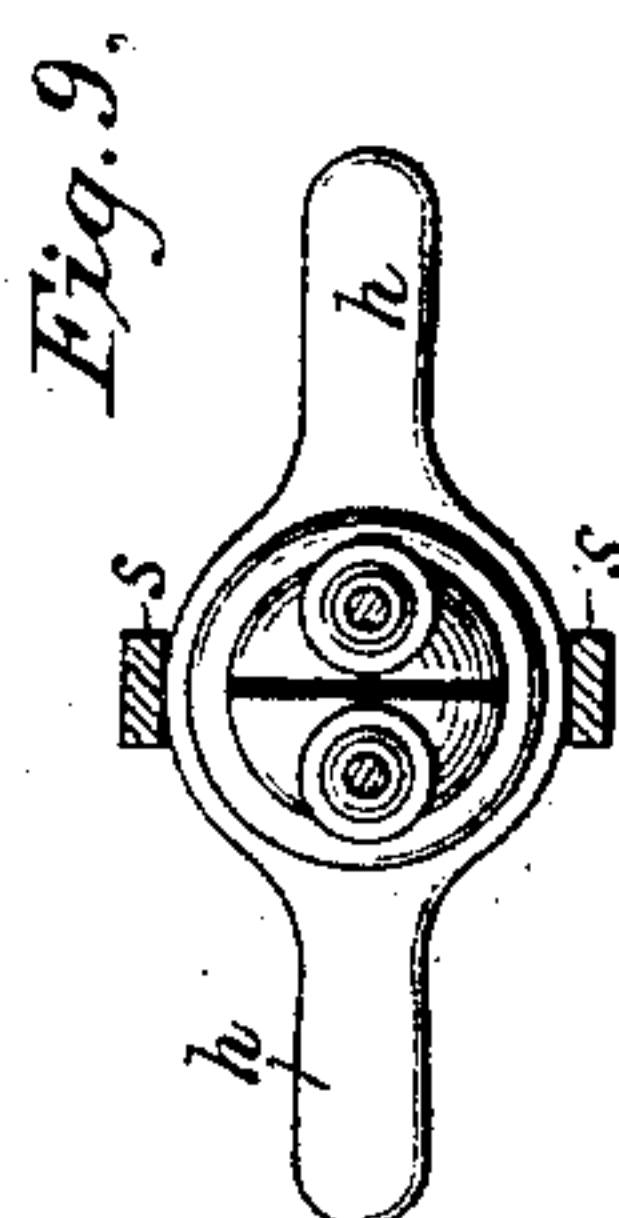
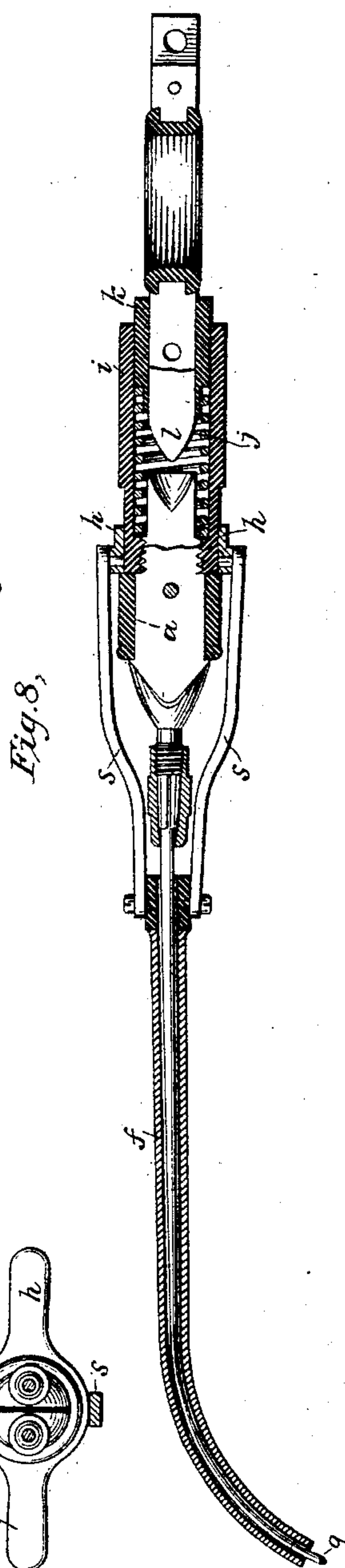
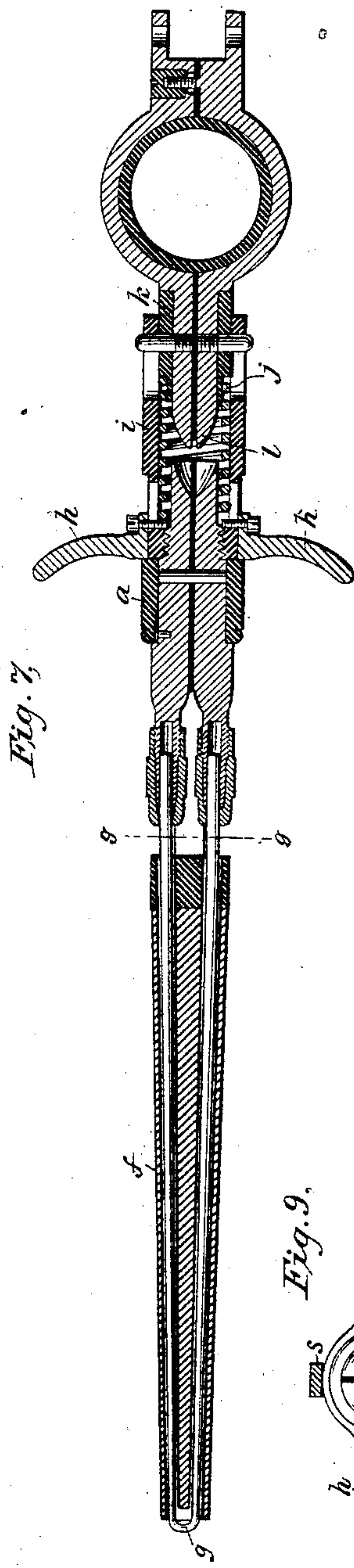
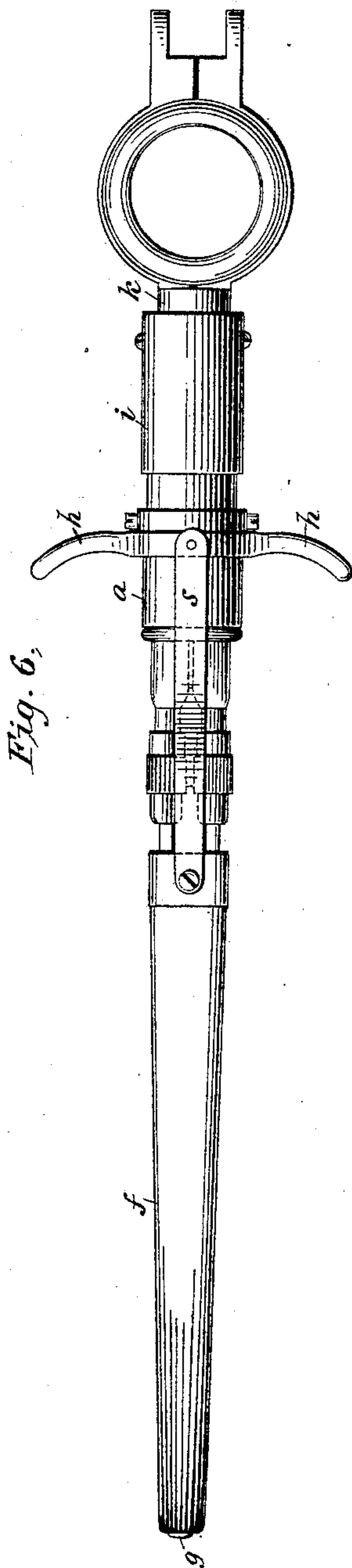
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UNITED STATES PATENT OFFICE.

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ELECTRO-CAUTERY INSTRUMENT FOR USE IN SURGERY.

SPECIFICATION forming part of Letters Patent No. 360,429, dated April 5, 1887.

Application filed August 13, 1886. Serial No. 210,795. (No model.)

To all whom it may concern:

Be it known that I, DAVID H. GOODWILLIE, residing in New York city, in the county and State of New York, have invented a new and
5 useful Improvement in Electro-Cautery Instruments for Use in Surgery; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being
10 had to the accompanying drawings, and the letters and figures marked thereon, which form a part of this specification.

My invention consists in the devices hereinafter described and claimed; and its objects
15 are to provide an instrument by means of which the cauterizing-wire can be introduced into the place or part of the body desired to be cauterized and can be removed again without injury to the surrounding parts; secondly,
20 to control the cauterizing-wire by easy but accurate means; thirdly, to enable the circuit to be conveniently closed or broken at any time desired and the instrument during such operation held with reliable firmness, and,
25 lastly, to so construct the instrument that it can be easily taken apart and cleaned or put in order.

In the accompanying drawings, Figure 1 is a side elevation of an instrument embodying one form of my invention. Fig. 2 is a vertical longitudinal section of the same, omitting
30 the shield. Fig. 3 is a horizontal longitudinal section. Fig. 4 is a detail view of the socket. Fig. 5 is a cross-section on the line 5 5 of Fig. 2. Fig. 6 is a side elevation of an instrument
35 embodying another form of my invention. Fig. 7 is a vertical longitudinal section of the form shown in Fig. 6, and Fig. 8 is a horizontal longitudinal section of the same. Fig. 9 is a cross-section on the line 9 9 of Fig. 7.

40 Similar letters indicate similar parts in the different figures.

My complete instrument, as shown in Figs. 1 to 3, consists of three parts—a handle, a body-piece, and a shield with the connected wire
45 electrodes.

a is the body-piece. It consists of a shell or case, preferably made cylindrical in general form, and of rubber or some other non-conducting material. This case contains two continuous strips of metal insulated from each
50 other, but forming parts of the working-circuit. From one end of these strips there projects a threaded portion or stud, upon which the handle is screwed. At their other ends

the strips are enlarged so as to form a socket, 55
e, for supporting the shield *f*. This socket, as shown, is not covered by the case or shell. It may be made of a separate piece and attached to the metallic strips of the body-piece in any convenient way. The socket must, 60
however, in either case, be made of two pieces of conducting material insulated from each other by rubber or other suitable means. I prefer to make the socket with two sets of holes or openings, as shown, so that the shield can 65
be placed at different angles with the body-piece. Thus the shield will be found convenient for use in cauterizing either within the cavities or on external parts of the body. The socket is provided with the set-screws *p p*, for 70
fastening the tubes of the shield in the socket. Set-posts are also provided for holding one end of the cauterizing snare or wire, as shown.

f is a shield for covering the cauterizing wire or electrode and preventing it from coming into contact with the flesh except at the 75
point of cauterization. The construction of this shield is plainly shown in Fig. 3. It consists of two tubes made of suitably rigid material, preferably of German silver, and insulated from each other and entirely covered by some suitably compact covering of a material that is at once a non-conductor of heat and a non-conductor of electricity. I prefer to use 85
asbestos as the covering for these tubes. The tubes project from one end, and the shield is fastened to the body-piece by inserting these projecting portions of the tubes into the holes in the socket and fastening them there by means of the set-screws *p p*. At the end from 90
which the tubes project the shield is further strengthened by a fitting of rubber or other suitably rigid and non-conducting material, which is pressed against the socket when the shield is inserted, and prevents the asbestos 95
from being broken or injured when the shield is pressed home in the socket. In the outer end of the shield I form a recess, so that the cauterizing-wire can be entirely covered and protected while it is being introduced into or 100
removed from any part of the body.

g is the cauterizing wire, snare, or ecraseur. One end of this wire is fastened to one of the set-posts *q q*. From the set-post the wire passes through the nearer tube of the shield 105
and projects from the outer end of the shield, so as to form a loop in the usual way, and then passes back through the other tube of the

shield, and is fastened at its other end to the ratchet-wheel *b*, electrical connection being made within the shield. This wheel *b* is pivoted to some part of the body-piece, and I prefer to mount it, in the manner shown, in a rectangular slot or opening in the middle of the body-piece itself. It revolves upon a shaft mounted in the body-piece. The shaft passes through one side of the body-piece, and has a knob or head on its outer end, by which it can be removed. The wheel is made with a circumferential groove to receive and hold the wire snare. The wheel and its shaft are preferably made of non-conducting material.

d is a ratchet consisting of a spring-piece, fastened at one end and having a pawl or pin attached to its movable end. The pawl fits into dents *c* in the wheel *b*, which dents are so made that the pawl does not prevent the wheel from turning in such a direction as to draw in the wire snare, but does prevent it from turning in the other direction. When the operator desires to uncoil the wire, he raises the movable end of the spring-piece, lifting the pawl away from the dents, and enabling the wheel to turn backward.

h is a finger-brace. In the forms of my invention shown in Figs. 1, 2, and 3 it is rigidly attached to the body-piece, and consists of a band of metal encircling the body-piece and having the two projecting arms shown. Attached to the other end of the body-piece is the handle, which is constructed as follows:

i is a hollow cylinder, of rubber or other suitable non-conducting material. At one end it has an internal screw-thread, by which it may be screwed onto a projecting portion of the body-piece. This projecting portion of the body-piece is made of conducting material and in two parts, the two parts being insulated from each other and connected, respectively, with the two parts of the circuit in the body-piece. In the end of this projecting portion a conical recess is formed, as shown.

j is a spiral spring placed in the cylinder *i* and bearing at one end against a shoulder in said cylinder, as shown, and at the other end against the cylinder *k*. The cylinder *k* is made of rubber or other suitable non-conducting material, and moves in the cylinder *i*. It is prevented from being drawn out of the cylinder *i* by means of stops or screws working in slots in the cylinder *i*, as shown.

The cylinder *k* incloses two strips of conducting material insulated from each other. These strips at their inner ends, *l l*, are made partly conical or bullet-like in shape, as shown in Fig. 5, and thus adapted to fit into the conically-shaped recess formed by the terminals of the body-piece. The end of each of these strips is half cut away, so that each terminal *l* has the form of a quarter-sector of a cone or bullet, and the two terminals *l l* are separated from each other by the spaces or interstices caused by this cutting away. The object of this is to prevent electrical contact between the two branches of the circuit at that point.

The spring *j* in its normal condition operates to hold the terminals *l l* away from the terminals of the body-piece. The conducting-strips in the cylinder *k* at their outer ends are curved so as to form a ring, which serves as a thumb-piece with which to press the terminals *l l* home. This curved portion of the circuit is properly protected by a ring of rubber or other suitable non-conducting material. The outer ends of the conducting-strips are held in proper position with respect to each other by a bolt passing from one through the other and having a nut screwed on its outer end. This bolt is properly insulated from the conducting-strip through which it passes. (See Fig. 2.)

Any suitable means may be employed for attaching the wires from a battery to the outer terminals of the handle. I prefer such a device as is shown in Fig. 1, consisting of two spring-pieces, *r r*, made of conducting material and attached to, though insulated from, each other. These spring-pieces have pins projecting from their ends, adapted to fit into holes in the end of the handle, and thus be brought into electrical contact with the circuit of the instrument. By pressing the pieces *r r* together, the pins at their ends can be slipped into the holes in the handle or removed therefrom. The elasticity of these pieces *r r* holds the pins in place when they are once inserted in the handle. The wires from the battery are permanently attached to the pieces *r r*, and by means of those pieces can be conveniently and securely attached to the instrument when desired.

Figs. 6, 7, 8, and 9 show a form of my invention in which the electrodes are fixed to the body-piece, instead of having the movable snare-electrode, already described. In this form, as there is no longer any need of a ratchet-wheel, the body-piece is simpler and shorter, but is made in substantially the same manner as before, with non-conducting shell or case, and the parts of a circuit inclosed or supported thereby and properly insulated from each other. In place of a socket, each part of the body-circuit is provided at its end with a slot or hole for receiving one end of the electrode and with a screw for securing the same therein, as shown in Fig. 7. In this form of my invention, as the electrode is fixed, I make the shield movable, to enable the operator to cover or uncover the end of the electrode at any time desired. To accomplish this I lengthen the cylinder *i* somewhat, and also the spring *j*. Then I attach the finger-brace *h h* to the handle, instead of to the body-piece, by means of screws moving in slots in the handle, as shown in Fig. 7. The inner ends of these screws bear against one end of the spring *j*. Two links or arms, *s s*, are attached to the shield at one end and to the ring portion of the finger-brace at the other end, as shown in Fig. 8. When the spring *j* is in its normal condition, the shield is held out by the arms *s s*, so as to cover or nearly cover the end of the electrode. When the finger-brace and

the thumb-ring are pressed toward each other, the circuit is closed and the end of the electrode uncovered at the same time. The finger-brace is prevented from being drawn back too far by a shoulder on the exterior of the cylinder *i*. In other respects this form is similar to the one already described.

Ecraseur or snare electrodes, with the ratchet-wheel, are used for the removal of pedunculated growths and tumors of all kinds from any part of the body, within or without, especially where it is desirable to encircle the part to be removed with a loop. The immovable shielded electrodes are peculiarly adapted for the removal of growths within cavities or passages of the body.

When the ecraseur or snare electrode is employed, the tumor or part to be removed or cauterized is first encircled by the loop of the electrode, and then, by pressing up the thumb-piece, the circuit is closed and the cauterization commenced. The snare is then gradually drawn in by turning the ratchet-wheel, and thus the cutting is accomplished. By drawing in the snare from one side only the cauterizing portion is given a knife-like action, and the snare can be more accurately controlled and the length of the wire drawn in can be measured by means of the graduated scale on the ratchet-wheel.

When the immovable shielded electrode is employed, the electrode is first introduced into the place or part to be cauterized, then the finger-brace and the thumb-piece are pressed together, and thus the circuit is closed and the electrode uncovered at the same time. By removing the pressure from the finger-brace the shield will be thrust forward again and the electrode covered.

The part of the electrode which is to do the cauterizing I prefer to make of platinum wire. The rest of the snare-electrode or of the wire connecting the fixed electrode with the circuit can be made of copper or any suitable conducting material.

The end of the snare-electrode is attached to the ratchet-wheel in the manner shown in Fig. 1 by passing it through a hole in the wheel, such as is shown, and bending the snare back so as to hook it onto the wheel at the farther end of the hole.

In the form of my invention shown in Figs. 6, 7, and 8 the terminals *ll* in the handle are not cut away, as in Fig. 2; but the two terminals are insulated from each other by rubber or other suitable material, and the body-piece and handle are so made that when the handle is screwed snugly onto the body-piece one terminal *l* will be just in line with and adapted to be pressed exactly into one side of the conical depression in the body-piece. The cylinder *k* covers the terminals *ll* sufficiently to prevent contact between them and the spring *j*.

What I claim as new, and desire to secure by Letters Patent, is—

1. An instrument for electrical cauteriza-

tion, consisting of a non-conducting case inclosing or supporting the parts of an electrical circuit, with suitable means for connecting the circuit with the wires of a battery, and a break in said circuit, and a movable part in the circuit for closing the break, and a cauterizing snare or wire, and a protecting-shield for said wire coated with non-conducting material, whereby during the cauterization only the cauterizing part of the wire is exposed and whereby no part of the cauterizing-wire is exposed while it is being introduced into or removed from the body, substantially as and for the purposes set forth.

2. An instrument for electrical cauterization, consisting of a handle having a non-conducting case inclosing or supporting the parts of an electrical circuit, with suitable means for connecting the circuit with the wires of a battery, and a body-piece having a non-conducting case inclosing or supporting the parts of a circuit to be connected with and forming part of the circuit in the handle, and also supporting a cauterizing-wire included in said circuit, and a break in said circuit, and a movable part in the circuit for closing the break, and a movable shield for protecting the cauterizing-wire, substantially as and for the purposes set forth.

3. An instrument for electrical cauterization, consisting of a handle having a non-conducting case inclosing or supporting two separate strips of conducting material, with suitable means for connecting these conducting-strips with the wires of a battery, a body-piece having a non-conducting case inclosing or supporting the parts of a circuit to be connected with the conducting-strips in the handle, and also supporting a cauterizing-wire included in said circuit, a shield for covering the cauterizing-wire except at the place of cauterization, and a break in the circuit, and a movable part in the circuit for closing the break, whereby the circuit can be quickly and easily closed and the cauterizing-wire will be covered except at the place of cauterization, and whereby various sizes of handle, body part, and shield can be used interchangeably, and whereby the instrument can be easily taken apart and cleaned or put in order, substantially as and for the purposes set forth.

4. In an instrument for electrical cauterization, in combination with the cauterizing wire or surface and mechanism for supporting it, a handle consisting of a hollow cylinder of non-conducting material fitted with an internal screw-thread at one end for attachment to the mechanism supporting the cauterizing-wire and having a spiral spring in the other end bearing against a shoulder on the interior of the cylinder, and a second cylinder of non-conducting material moving back and forth within the first cylinder and inclosing the parts of an electric circuit, with terminals projecting from the interior end and having suitable means for connecting the circuit with the

battery, and having a thumb-piece, the second cylinder being attached to the first by means of screws moving in slots, whereby when the cauterizing-wire is in position the cylinder supporting the circuit can be pressed forward in the outer cylinder and the terminals in the handle be brought into electrical contact with the cauterizing-wire and the entire circuit be closed, and whereby the circuit will be broken again by the action of the spring when the thumb-piece is released from the pressure, substantially as and for the purposes set forth.

5. In an instrument for electrical cauterization, in combination with the cauterizing wire or surface and mechanism for supporting it, a handle consisting of a hollow cylinder of non-conducting material fitted with an internal screw-thread at one end for attachment to the mechanism supporting the cauterizing-wire and having a spiral spring in the other end bearing against a shoulder on the interior of the cylinder, and a second cylinder of non-conducting material moving back and forth within the first cylinder and inclosing the parts of an electric circuit, with terminals having a conically-shaped joint projecting from the interior end of the inner cylinder, adapted to fit into a conically-shaped recess of conducting material in the mechanism supporting the cauterizing-wire, the inner cylinder having suitable means for connecting its circuit with a battery and having a thumb-piece and being attached to the outer cylinder by screws moving in slots, whereby when the inner cylinder is pressed forward in the outer cylinder electrical contact between the handle and the cauterizing mechanism will be more certainly established by the conically-shaped terminals fitting into the conically-shaped recess, substantially as and for the purposes set forth.

6. In an instrument for electrical cauterization, in combination with a suitable case of non-conducting material inclosing or supporting the parts of a circuit and a break in said circuit and a movable part in the instrument for closing the break and having suitable means for connecting the cauterizing wire or surface with the circuit, a wheel or reel pivoted to the body-piece upon which the cauterizing-wire is partly wound and a protecting-shield having a recess at its outer end to completely inclose the cauterizing-wire, whereby the cauterizing-wire can be let out or drawn in, as desired, and the circuit be closed at the desired time without at any time detaching the wires of the battery, substantially as and for the purposes set forth.

7. In an instrument for electrical cauterization, in combination with a suitable case for supporting the cauterizing wire or material and for connecting it with the battery, a graduated reel pivoted to such case and upon which the cauterizing-wire is partly wound, whereby the cauterizing-wire can be drawn in or let out in definite lengths.

8. In an instrument for electrical cauterization, in combination with a suitable handle, a body-piece consisting of a case of non-conducting material inclosing or supporting the parts of a circuit, a socket-piece attached to the end of the body-piece, a shield of non-conducting material for inclosing the cauterizing-wire, adapted to fit into the socket-piece, a graduated wheel or reel pivoted to the body-piece, upon which the cauterizing-wire is partly wound, and dents in the wheel or reel, and a ratchet falling into the dents, whereby the cauterizing-wire can be drawn in and let out in definite lengths and is prevented from slipping out by the action of the ratchet, substantially as and for the purposes set forth.

9. In an instrument for electrical cauterization, in combination with a suitable case of non-conducting material supporting the parts of a circuit and a socket-piece attached to the body-piece and a cauterizing-wire with suitable mechanism for controlling it, a shield consisting of two electrically-conducting tubes having a recess at the outer end of each to inclose the cauterizing-tip and coated with asbestos and adapted to fit into the socket-piece, whereby the cauterizing-wire can be entirely protected, substantially as and for the purposes set forth.

10. In an instrument for electrical cauterization, in combination with suitable mechanism for supporting and regulating the circuit and the cauterizing-wire and a shield for protecting that wire, a socket-piece with two or more sets of openings in which to fasten the shield, whereby the shield and the wire inclosed by it may be made to extend at suitable angles with the body of the instrument, substantially as and for the purposes set forth.

11. In an instrument for electrical cauterization, in combination with a suitable handle, a body-piece consisting of a case of non-conducting material inclosing or supporting the parts of a circuit and a wheel or reel pivoted to the body-piece and a cauterizing-wire one end of which is fastened firmly to the body and the other end of which is wound upon the wheel or reel, whereby the cauterizing-wire is let out or drawn in at one end only, and thus a cutting or knife-like motion is given to the wire, substantially as and for the purposes set forth.

12. In an instrument for electrical cauterization, consisting of a body-piece, *a*, the wheel *b*, the dents *c*, the ratchet *d*, the socket *e*, the shield *f*, the cauterizing-wire *g*, the finger-brace *h*, the cylinder *i*, the spring *j*, the cylinder *k*, the conically-shaped terminals *l l*, the thumb-ring, and the device *o*, for attaching the instrument to the battery, substantially as and for the purposes set forth.

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Witnesses:

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