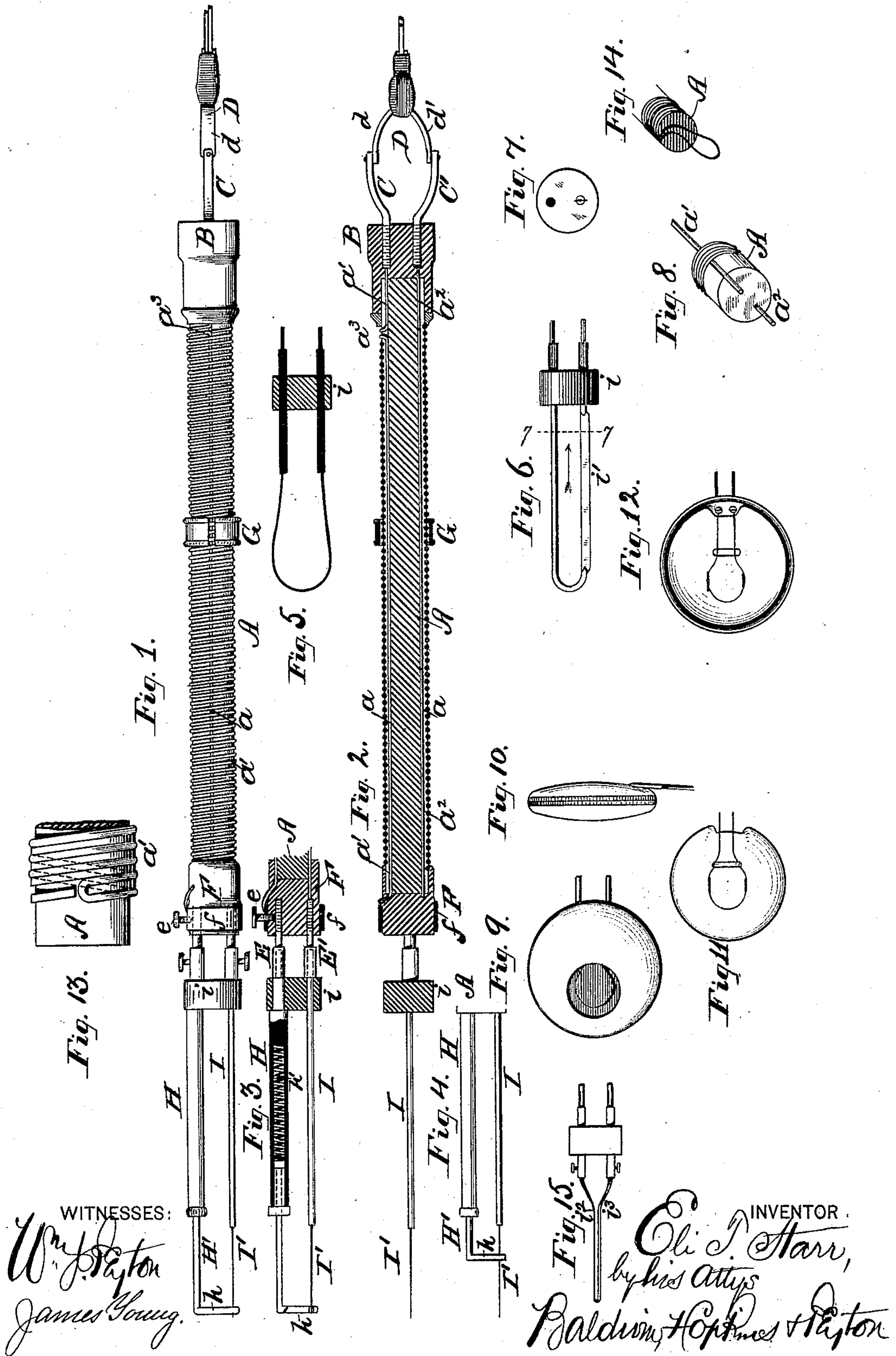


(No Model.)

E. T. STARR.
ELECTRICAL CAUTERIZING APPARATUS.

No. 300,155.

Patented June 10, 1884.



UNITED STATES PATENT OFFICE

ELI T. STARR, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE S. S. WHITE DENTAL MANUFACTURING COMPANY, OF SAME PLACE.

ELECTRICAL CAUTERIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 300,155, dated June 10, 1884.

Application filed February 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, ELI T. STARR, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Cauterizing and Similar Apparatus, of which the following is a specification.

My invention relates more particularly to apparatus for cauterizing or burning, the heating of the apparatus to perform the cauterizing operations which may be effected thereby being produced by electricity. My invention therefore relates to what is known as "electro-cautery."

The object of my invention more especially is to provide an improved electro-cauterizing apparatus.

The nature of my improvements and the subject-matter claimed by me herein will first be set forth in detail as organized in the best ways now known by me and will then be distinctly recited at the close of the specification.

I wish it to be distinctly understood that some of my improvements claimed herein may be used without the others, and with apparatus organized in other ways than that particularly shown in the accompanying drawings and set forth herein.

In said drawings, which show various applications of my improvements, Figure 1 is a view in elevation of my improved apparatus, organized more especially for destroying the nerves of the human teeth. Fig. 2 is a longitudinal section through the apparatus. Fig. 3 is a similar section through a portion of the apparatus, showing the cauterizing nerve-destroying needle as in position to be heated to incandescence; and Fig. 4 is a view showing the end of the needle exposed and projecting forward, as when it enters the nerve or pulp canal of a tooth. Fig. 5 is a view of a cauterizing-loop, instead of a needle, for the performance of minor surgical operations. Fig. 6 shows a cauterizing-knife, to be used in surgical operations. Fig. 7 is a section through the apparatus shown in Fig. 6 on the line 7 7 of said figure. Fig. 8 is a view of the front end of the main or handle portion of the apparatus. Fig. 9 is a view of an incandescent electric lamp inclosed in a flat guard or casing for use in exploring and examining the mouth,

which is to take the place of the cauterizing implements. Fig. 10 is an edge view of the lamp shown in Fig. 9. Fig. 11 is a view of the flat lamp detached from its guard or casing, and Fig. 12 is a view of said lamp with one side of the casing or guard thereof removed. Fig. 13 is an enlarged view of the front end of the handle portion of the instrument, (shown in Figs. 1 and 2,) in order to illustrate clearly the manner of constructing a portion of the circuit-connections by which the resistance of the device or the flow of current to the cauterizing tool or lamp may be regulated. Fig. 14 is a section through the front end of the handle portion of the apparatus for a similar purpose; and Fig. 15 is a modified form of cauterizing-needle to be carried by the handle of the instrument and substituted, for instance, in place of the single needle shown in some of the other figures of the drawings.

The handle portion A of my improved instrument is preferably made of a non-conducting material—such, for instance, as wood, ivory, or hard rubber—and is provided at opposite sides with two longitudinal grooves, *a a*, extending from end to end of said handle portion A, for the reception of the circuit-wires *a' a'*, so that said circuit-wires *a' a'* lie in said longitudinal grooves below the surface or periphery of the handle portion A, which is preferably cylindrical. The butt-end of said handle portion A is provided with a cap or ferrule, B, carrying connecting-posts C C', to which the respective wires *a' a'* are firmly united. The outer or free ends of said connecting-posts are socketed, for instance, so as to receive the projecting pins of a spring-connection or yoke, D, the members *d d'* of which are united to an insulating-block, and are connected to the respective wires leading to a battery or other electric source. Said circuit-wires are preferably bound together by a suitable woven fabric, so as to be insulated, while at the same time flexible, whereby the instrument is capable of being freely moved about within certain limits, in order to enable the free operation, control, and direction thereof. The freedom of movement of the instrument is further aided by the pivotal connection between the connecting-posts C C' and the yoke D. The inner ends of the circuit-wires *a' a'*

are connected, respectively, with terminal posts E E', the circuit-wire a^2 being directly and firmly united to the post E', while the circuit-wire a' is united to the post E, preferably by means of a set-screw, e , passing into an insulated ferrule, F, at the front end of the handle portion A of the instrument, from which ferrule said posts E E' project, the front end of the wire a' being soldered or otherwise united to a metal ring, f , surrounding the insulated cap or ferrule F, and the set-screw e passing through said metal ring f and making contact with the post E. By this means it will be understood the circuit may be readily made and broken. This is a simple form of make-and-break device for the instrument; but it will of course be understood that any other suitable make-and-break device may be employed, instead of that particularly shown, and that it may be located at the butt-end of the handle, for instance, instead of at the front end. In the organization I have shown, one of the wires—for instance, the wire a^2 —passes directly through the handle to the post E', while the other wire, a' , passes a short distance into its groove a , is then looped, and the end of the wire then passed through said groove a , so as to be connected with the post E. The loop formed in the wire a' is of considerable extent, and is utilized by me as a resistance medium, by which the resistance to the passage of the electric current may be regulated. To this end I form a double spiral or screw groove in the periphery of the handle portion A, and wind the loop in said groove spirally from end to end of the handle, the members of the loop being insulated by the ribs or projections between the grooves or threads in the handle from each other. The loop is of such length that it may be wound spirally around the handle from end to end and terminate under the cap or ferrule F at the front end of the handle of the instrument. This loop-wire is preferably a high-resistance wire—such as German silver—and the grooves in the handle are only of such depth as to receive and hold the wire, leaving the surface thereof projecting above the insulated surface of the handle. The current therefore, in passing through the instrument, passes, for instance, through the wire a' at the butt-end of the instrument, then spirally through one member of the wire loop spirally wound upon the handle, then back again through the other member of the loop to the point a^2 , and then through the straight portion of said wire a' , which lies in the groove a between the loop in said wire and the connecting-post E. Thus it will be seen the current has to travel a considerable extent of resistance-wire, and in order to vary the resistance, and to throw in more or less of this resistance-wire, I mount upon the handle a conducting ring or ferrule, G, which makes contact with several of the coils of the wire loop wound about the handle, and thereby, it will be obvious, electrically connects both the leading and return members of the wire loop; and if

said ring or ferrule be at or near the butt of the instrument will obviously cut out virtually all of the wire in the resistance-loop, because the current, instead of having to travel one member of the loop and return by the other, is short-circuited from one member to the other at or near the butt of the instrument. By adjusting the short-circuiting ferrule G, therefore, endwise upon the handle portion A of the instrument, more or less of the resistance-wire is put into the circuit as may be desired, in order to regulate the effect of the current upon the apparatus carried by the handle and which is to be operated or affected by said current. If, for instance, instead of the ring or ferrule G being at the butt of the instrument, it is moved up to the front end, substantially all the resistance-wire will be put into the circuit. I therefore have a handle with a spirally-wound resistance-wire and an endwise movable contact ring or ferrule by which the resistance to the passage of the current may be varied; but this, broadly, is not claimed by me herein.

In Figs. 1, 2, 3, and 4 the conducting-post E is connected with a metal tube, H, containing a plunger, H', with a bent end, h , said plunger being of metal or conducting material, and being acted upon by a spring, h' , in said tube H, so as to thrust the plunger normally outward, as shown in Figs. 1 and 3. The opposite post, E', is connected to an arm, I, carrying at its front end a fine needle, I'—for instance, of platina—the front end of said needle resting in a recess or socket in the bent end h of the plunger H', and making contact therewith, so as to complete an electrical connection. This needle I' constitutes in the figures mentioned the cauterizing-tool, and when sufficient current is flowing over the circuit, determined by adjusting the ring or ferrule G, said needle is intensely heated or brought to incandescence by the passage of the current through it, due to the electrical resistance of said needle. When, therefore, the cauterizing-needle is to be employed to destroy, for instance, a diseased nerve in a human tooth, the circuit is completed through the instrument and the needle brought to incandescence. The bent end h of the plunger H' is then placed against the tooth with the end of the cauterizing-needle over the cavity therein. Pressure applied upon the handle to force it forward causes the tube H to ride over or upon the plunger H' and thrust the needle I' through the bent end of said plunger into the nerve or pulp canal, the needle projecting beyond the end of the plunger, as shown in Fig. 4. This instantly destroys the vitality of the nerve or pulp and the operation is painless, which is a great desideratum, as it is frequently necessary in dentistry to destroy the nerve or pulp of a tooth, and heretofore this could only be successively accomplished by very skillful continuous treatment.

I have neglected to mention that the conducting-posts E E' or the parts connected there-

with are preferably suitably braced or strengthened by an insulating connecting-block, *i*.

In place of the cauterizing-needle, the conducting-posts or terminals at the front end of the handle may be connected by a cauterizing-loop, which on the passage of the current through it will be heated to incandescence, and be useful in performing many surgical operations where either a separation or cauterizing of parts is necessary. This loop is shown in Fig. 5.

In place of the needle and of the loop above mentioned, it will also be desirable, in many cases, to have a cauterizing-knife, and this I have provided, as shown in Fig. 6, the blade $\frac{1}{2}$ being of high resistance, and being heated to incandescence by the passage of the electric current through it.

I have also shown in Fig. 15 a cauterizing-needle, which is a double needle—that is to say, it has a reduced member, *i*², which is heated to incandescence by the passage of a current through it, the other member, *i*³, of the needle being a strengthening-support to the incandescence portion, and enabling the needle to be maintained at incandescence as long as the passage of the current continues, which is not the case with the needle first described, because when projected into the tooth the current is short circuited from a greater portion of the needle, and from its front end, as clearly shown in Fig. 4, which causes the needle to be reduced in temperature at that end to a very large degree, as will be obvious to any skillful electrician.

In place of the cauterizing-tools above described, my improved handle may have applied to it an incandescent electric lamp, which is preferably a flat and small lamp incased in a non-conducting guard or cover having an opening at one side to permit the passage of the light rays, such a lamp being highly useful in dentistry, and facilitating the examination of teeth to which natural light-rays have difficult access, the lamp being placed in the mouth without danger of heating or burning the patient.

This invention of a mouth-lamp for use in dentistry, which can be placed in a patient's mouth to facilitate its examination, forms the subject-matter of other applications of mine already filed, and is therefore not claimed herein, although it serves to show that various devices other than cauterizing-tools, may

be used with my improved resistance-handle and organization of parts herein shown and described.

I claim as my invention—

1. A non-conducting handle provided with insulating-ferrules at its ends and with opposite longitudinal grooves, in combination with circuit-wires fitted in said grooves, and one of said wires being formed into a loop and wound spirally around the handle to constitute a resistance device, substantially as described.

2. A non-conducting handle provided with insulating-ferrules at its ends, and with opposite longitudinal grooves, in combination with circuit-wires fitted in said grooves, and one of said wires being formed into a loop and wound spirally around the handle to constitute a resistance device, and with a tool or device carried by the front end of the handle to be affected by the current flowing over said circuit-wires, substantially as described.

3. The combination of a handle carrying conducting-connections, with a single incandescing cauterizing-needle connected with said conducting-connections and rendered incandescent by the current passing therethrough, substantially as described.

4. The combination of a handle carrying conducting-connections, with a cauterizing-needle in circuit with said connections, and a plunger making contact therewith and movable endwise, so as to allow said needle to be protruded in front of said plunger, substantially as described.

5. The combination of a handle carrying conducting-connections, with a cauterizing-needle in circuit with said connections, and a spring-plunger making contact therewith, and movable endwise relatively to said needle, substantially as described.

6. A cauterizing-needle consisting of two members, one only of which is brought to incandescence in operation, and is of materially higher resistance than the non-incandescent member thereof, substantially as described.

In testimony whereof I have hereunto subscribed my name this 8th day of February, A. D. 1884.

ELI T. STARR.

Witnesses:

WM. J. PEYTON,
E. EUGENE STARR.