

(No Model.)

2 Sheets—Sheet 1.

L. E. CUSTER.
ELECTRICAL MUFFLE OR HEATER.

No. 569,911.

Patented Oct. 20, 1896.

Fig. 1.

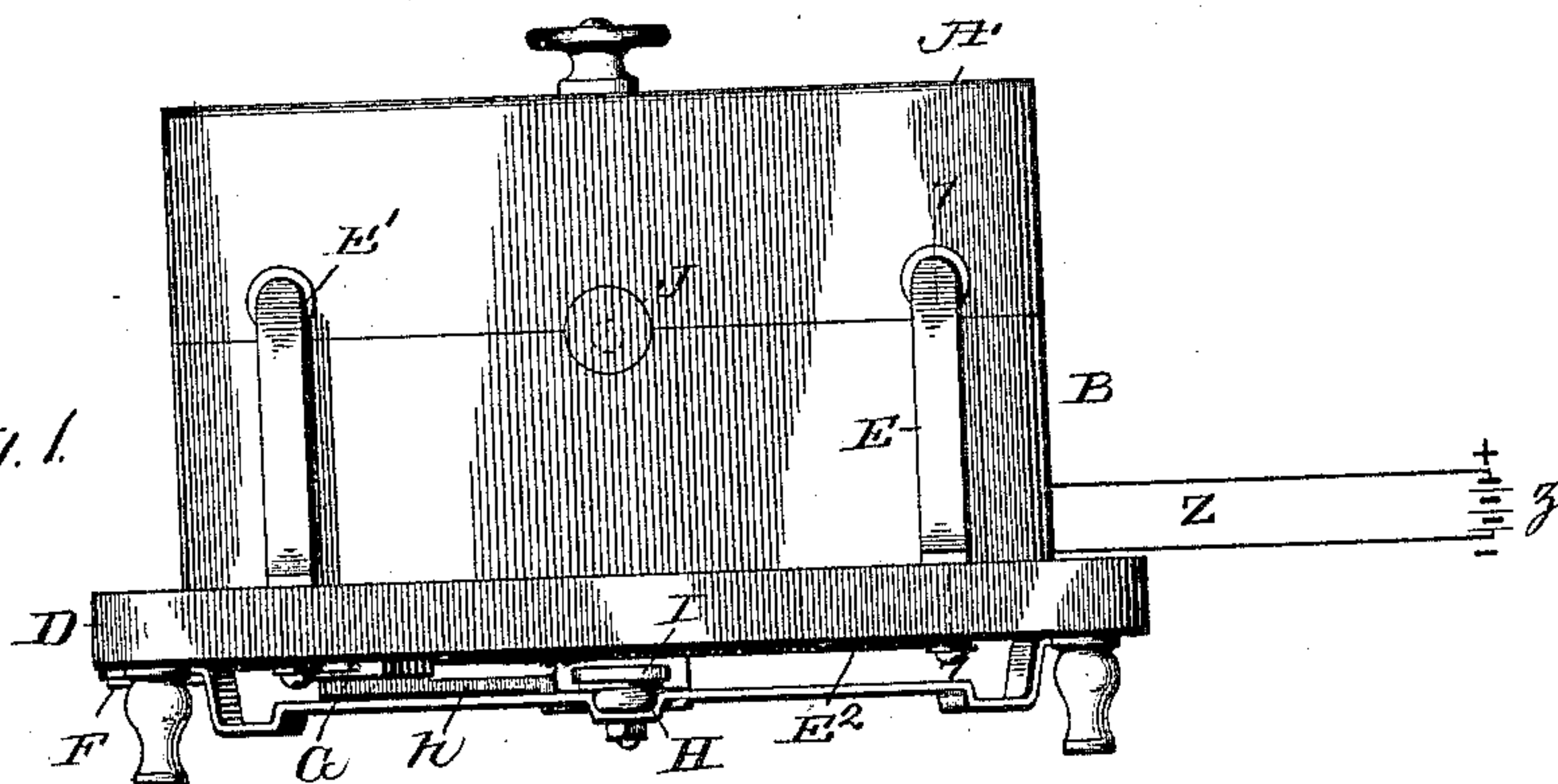


Fig. 2.

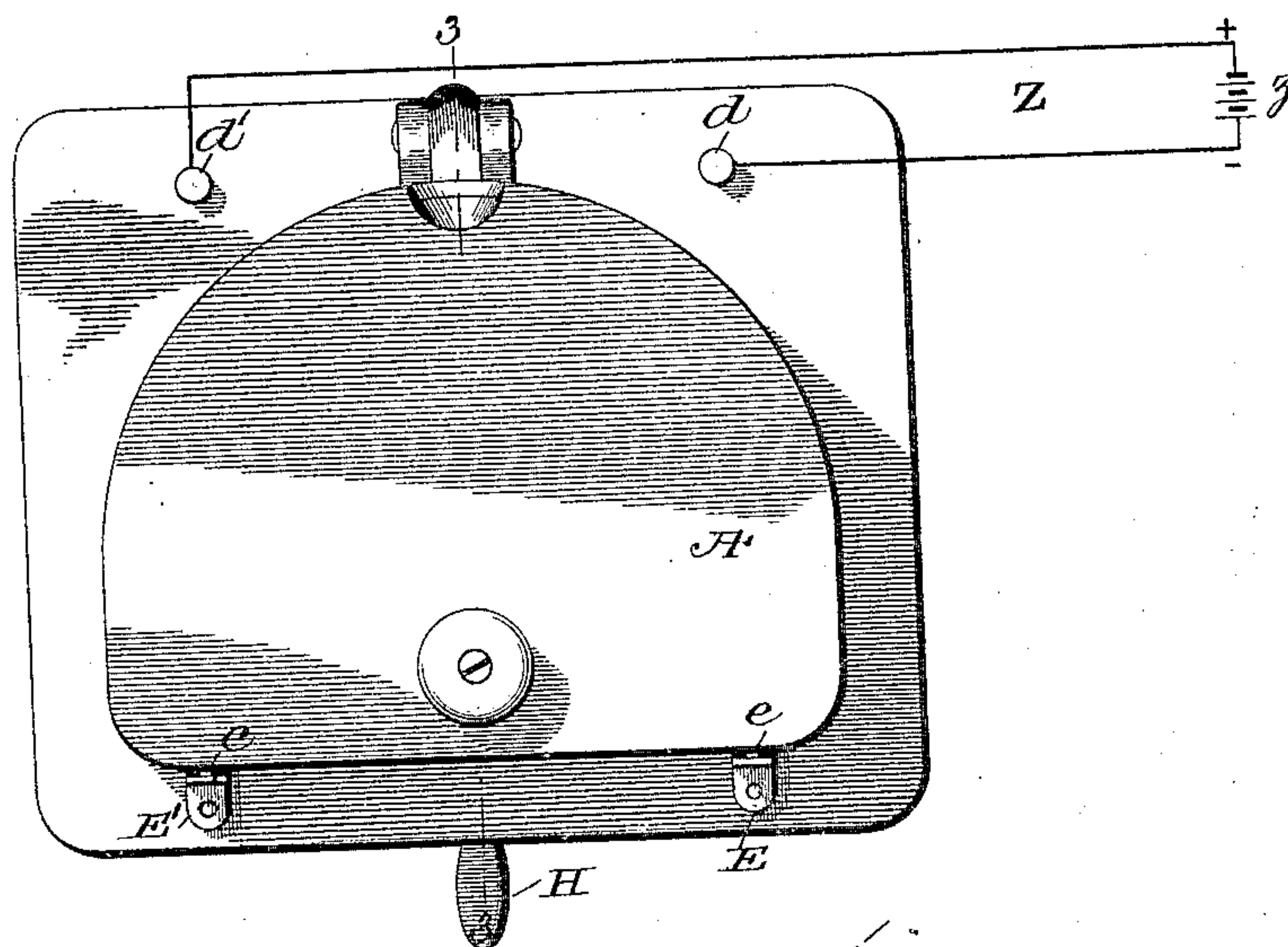
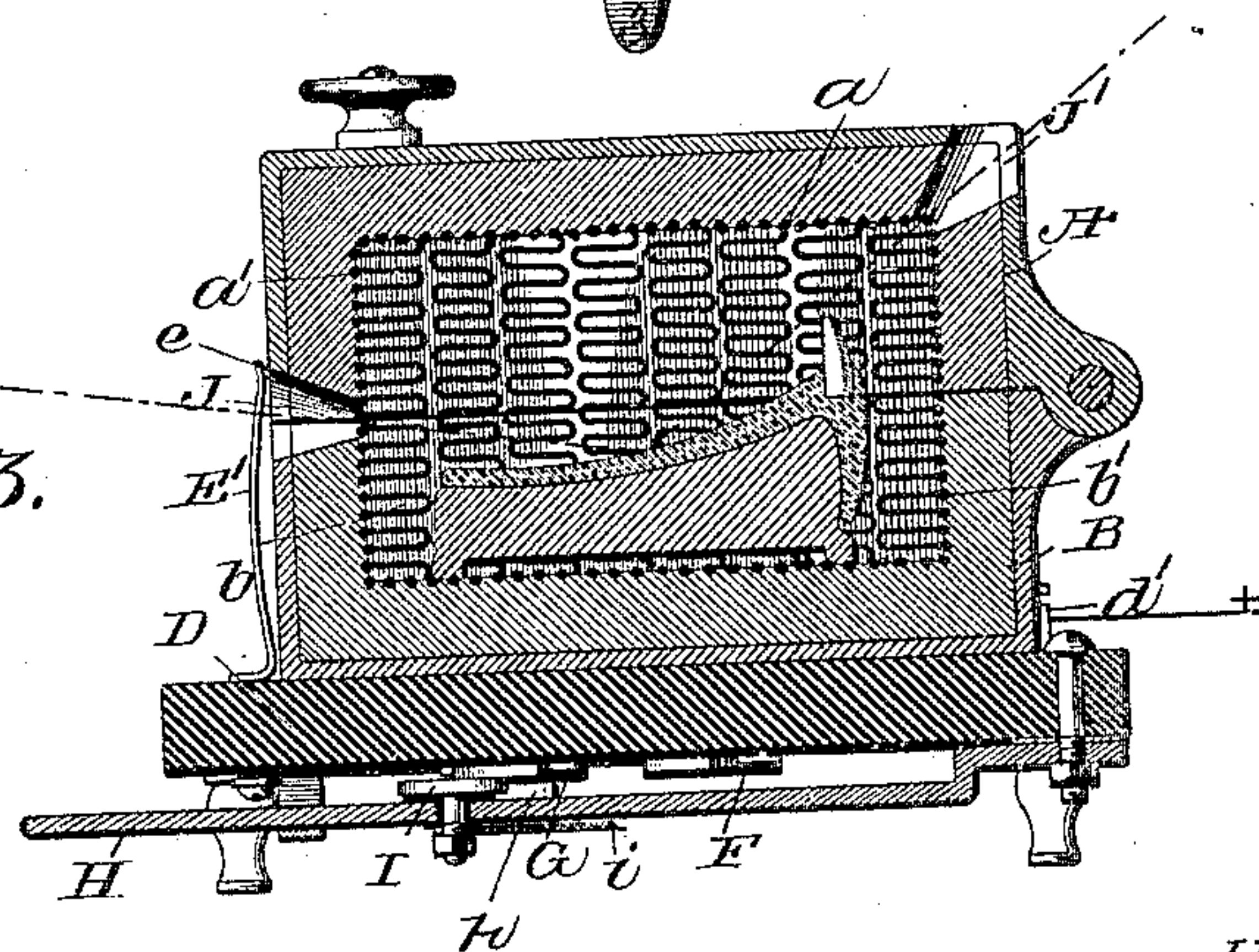


Fig. 3.



WITNESSES

Jos. C. Stack.

James R. Mansfield.

INVENTOR

Levitt E. Custer.

Per. Alexander & Sonnell

Attorneys

(No Model.)

2 Sheets—Sheet 2.

L. E. CUSTER.
ELECTRICAL MUFFLE OR HEATER.

No. 569,911.

Patented Oct. 20, 1896.

Fig. 4.

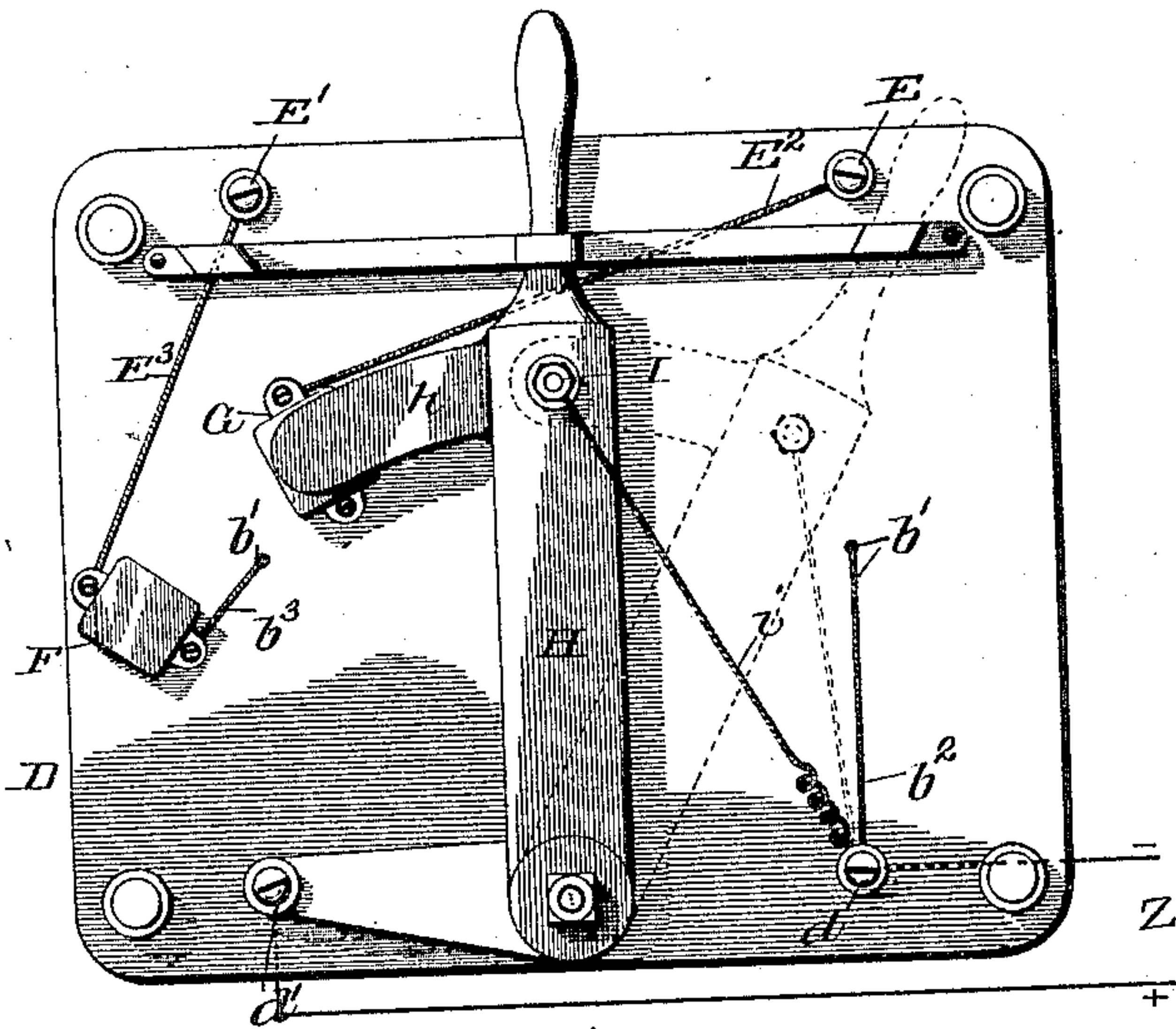


Fig. 5.

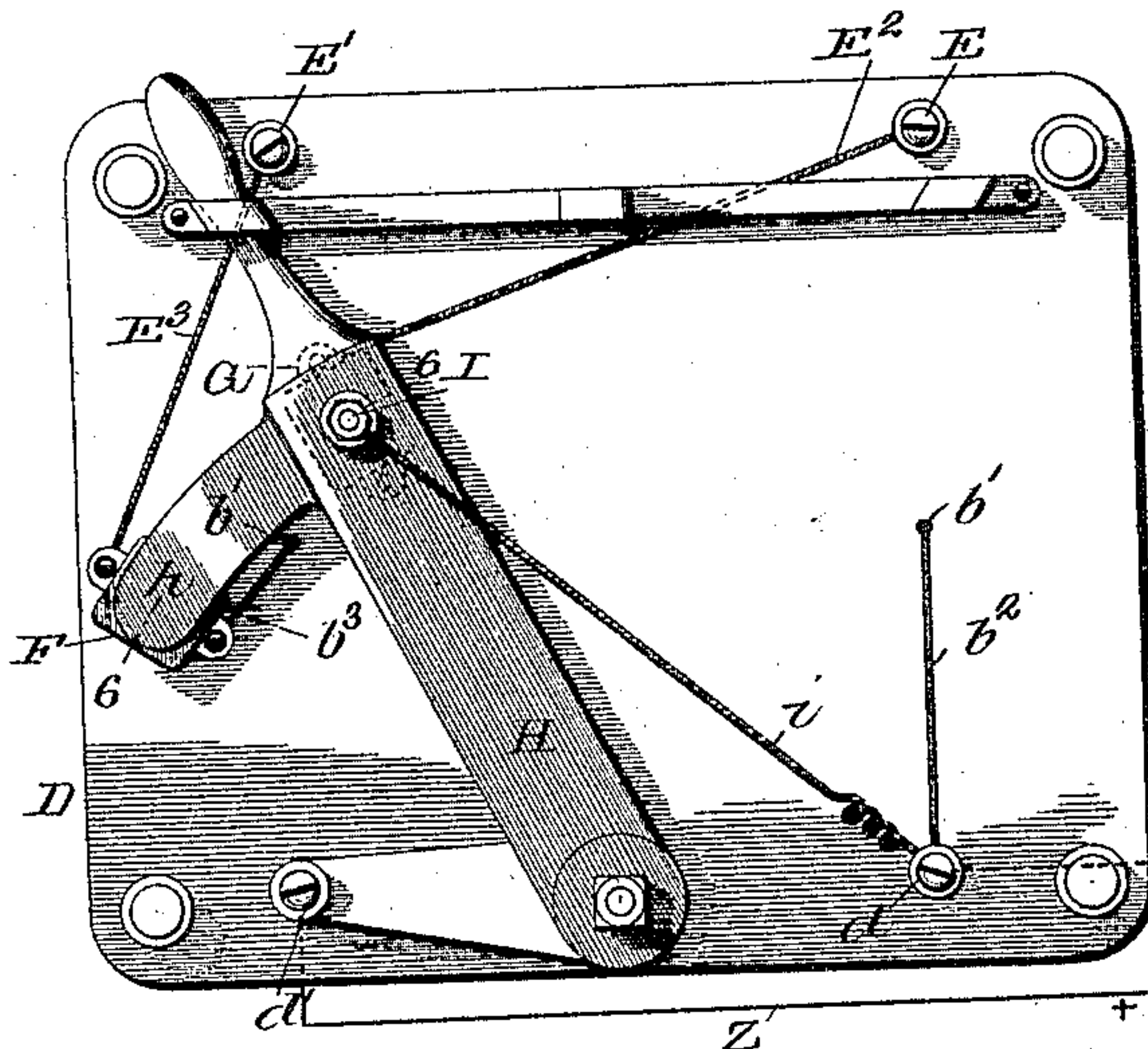


Fig. 6.

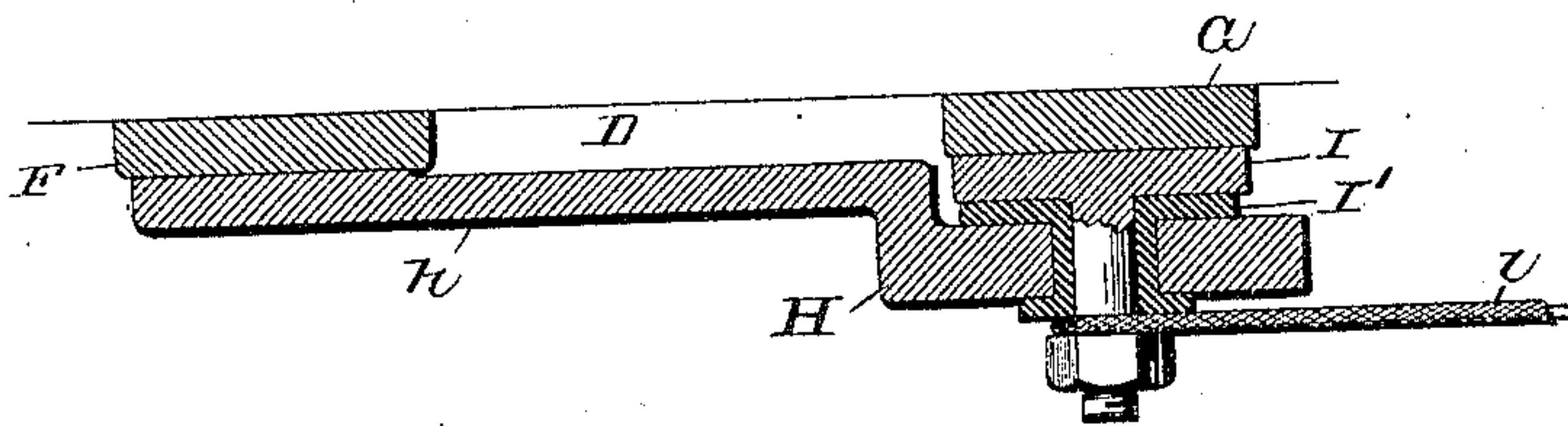
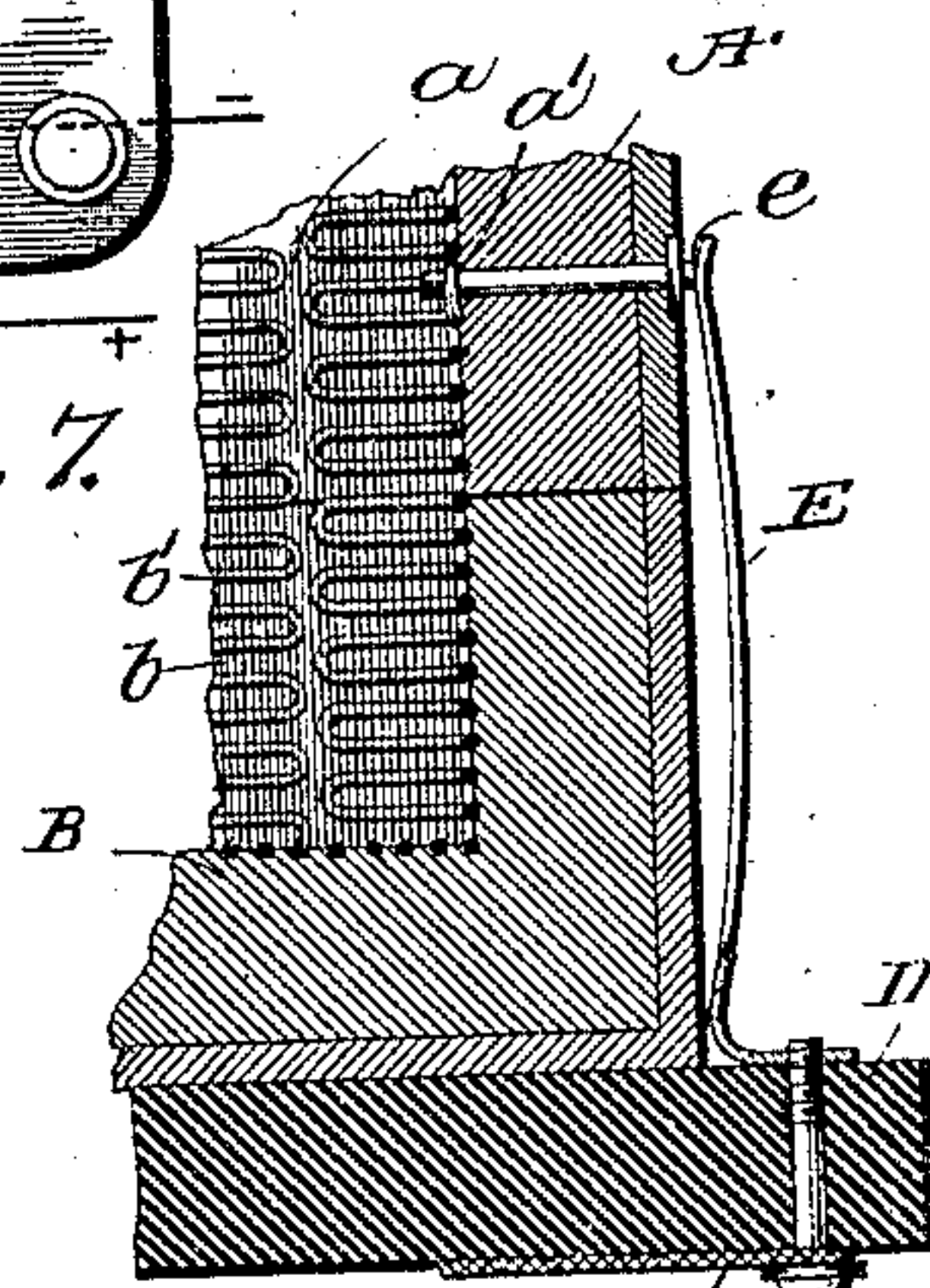


Fig. 7.



WITNESSES

Jos. A. Stack.
James R. Mansfield.

INVENTOR E²
Levitt E. Custer.
Per Alexander & Dowell
Attorneys

UNITED STATES PATENT OFFICE.

LEVITT E. CUSTER, OF DAYTON, OHIO.

ELECTRICAL MUFFLE OR HEATER.

SPECIFICATION forming part of Letters Patent No. 569,911, dated October 20, 1896.

Application filed May 31, 1895. Serial No. 551,034. (No model.)

To all whom it may concern:

Be it known that I, LEVITT E. CUSTER, of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and
5 useful Improvements in Electrical Muffles or Heaters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of
10 reference marked thereon, which form part of this specification.

The object of this invention is to provide an electrical heater or muffle especially designed for use by dentists in the manufacture
15 of porcelain dental plates; and the invention embraces the important features of the muffles disclosed in my applications for Letters Patent, Serial Nos. 532,646 and 532,647, filed December 22, 1894, and certain other improvements also.

The invention consists, first, in a quick and powerful electrical heater produced by substantially covering the entire inner surface or walls of the heating-chamber with resistance-wires; second, in utilizing the heating-wires in the muffle as a rheostat to regulate the temperature and the initial heating of the muffle; third, in improved switch devices for shifting the current through the resistances in the muffle in series or multiple;
30 fourth, in the novel construction or arrangement of sight-openings in the muffle, whereby the proper heating or fusion of the substance being treated can be readily determined by reflection of light through said openings.

The invention is summarized in the claims, and the best form of muffle now known to me is constructed substantially as shown in
40 the drawings and hereinafter described in detail.

In said drawings, Figure 1 is a front view of the muffle; Fig. 2, a plan view; Fig. 3, a vertical section on line 3 3, Fig. 2; Fig. 4, a
45 bottom plan view with switch "off" in dotted lines and shifted to throw the resistances in series in full lines. Fig. 5 is a similar view with switch shifted to throw resistances in multiple. Fig. 6 is a detail transverse
50 section through the switch-lever and button on line 6 6, Fig. 5. Fig. 7 is a detail vertical section on line 7 7, Fig. 1.

The muffle consists of upper and lower parts A B, which are closely fitted together and internally lined with refractory material, such as fire-clay. In each part is a cavity *ab*, which when the parts are fitted together constitute the heating-chamber. Part B is mounted on an insulating-base D, of suitable material, on which are two binding-posts *d d'*, to which are connected wires Z, leading to a battery *z* or other suitable current-generator, with which the muffle is in circuit. The entire inner surface or walls of each cavity *ab* is substantially covered with serpentine layers of platinum wire or other suitable high resistance not liable to buckle or fuse at the temperature requisite to fuse porcelain. This resistance is preferably embedded in the walls of the cavities just sufficiently to hold it in position and prevent short-circuiting, while allowing the greatest amount of heat to escape by conduction, convection, and radiation into the chamber of the muffle.

It will be noted that the resistances substantially cover every portion—top, bottom, and sides—of the chamber in the muffle, and this complete envelopment of the walls with high-resistance wires I claim as new and of the utmost importance in dental work and for fusing porcelain. I also preferably employ platinum wire as most free from buckles and capable of withstanding a temperature greater than is necessary to fuse porcelain.

As the fusing-points of high-fusing porcelain and of platinum are nearly the same, the inner surface of the muffle should be covered with the platinum wire as compactly arranged as is possible, while preventing a short circuit between adjoining portions of the wire, so that an individual strand of wire will not have to be so highly heated when there are many of them in a given area as it would be if there were fewer or more distantly separated strands. By having the wires so close together as to present an almost solid radiating-surface more heat will be developed in the muffle with less danger to the wire.

I am aware that portions of the walls of chambers in muffles and heaters have been covered with resistance, and I disclaim such, as they produce an unequal heating effect in the chamber.

By having every part of the chamber-walls

covered with heating-wires the greatest amount of heat and equality of temperature is attained in the muffle, since there will be no unprotected parts of the walls where the heat will be lost by conduction. This complete envelopment of the muffle-chamber in heating-wires I consider a very important feature of the invention.

The ends of the resistance a' in part A are connected to contacts ee' , projecting through the wall of said part and respectively contacting with upstanding spring-conductors E E', attached to the base D, as shown. One end, b^2 , of the resistance b' in part B is connected to post d , and the other end, b^3 , is connected to a contact-plate F, fastened to the under side of base D. Spring E is connected by a wire E^2 to a contact-plate G, fastened to the under side of base D near plate F, and spring E' is connected by a wire E^3 to the plate F, as shown.

A switch H is pivoted to the under side of base D and is electrically connected with post d' . Said switch has a contact-arm h , which is adapted to make contact with plate G or F, if properly shifted, or to break contact with both and cut the muffle out of or break the circuit. Attached to this switch is a contact-button I, insulated from the switch by a bushing I', as shown, electrically connected by a flexible or yielding connection i to post d . When arm h contacts plate F, button I will contact plate G. The object of this construction is to enable the operator to employ resistances a' b' in series or in multiple and utilize these resistances as a rheostat in starting up the heater, for in dental work it is desirable to subject the plates to a low or slow heat until the oven is heated thoroughly and the plates thoroughly dried, and then to use the greater heat to fuse the porcelain, &c.

By first connecting resistances a' b' in series there is a great resistance to the current and a low heat is obtained. Then by switching the current through the resistances in multiple parallel the resistance is halved and the current passing consequently doubled, greatly increasing the temperature. When switch H, therefore, is turned so that arm h contacts plate G, the current passes from post d' to spring E and through resistance a' back to spring E', thence to plate F, then through resistance b' to post d , thus going through resistances a' b' in series. When the switch is turned so as to contact arm h with plate F and button I with plate G, the current enters from post d' through the switch to plate G, there divides, part passing through resistance b' to post d , and part passing through springs E', resistance a , spring E, wire E^2 , plate A, button I, and cord i to post d , thus halving the resistance and doubling the current passing through the muffle.

I do not confine myself to the particular construction herein shown and described, as the principal feature of this part of my invention is the employment of resistances in

a muffle or heater with means whereby the current can be sent through the resistances in series or in multiple.

Two sight-openings J J' are made in opposite sides of the muffle, one preferably at an angle of about forty-five degrees above the other. Now it is very difficult to ascertain the exact degree of fusion of porcelain on a dental plate when looking directly into a muffle through a single opening, as in the old forms. This difficulty I overcome by using the two openings, as shown, both of which can be quite small. By this arrangement a ray of light entering one opening will be reflected out through the other, and by the amount of reflected light the condition of the glaze or fusion of the porcelain can be very readily and accurately determined. As the light is to be reflected from the object to be fused, the positions of the openings will depend somewhat upon the objects to be treated, or the objects must be arranged in the muffle with reference to the openings. The principal idea is to have the openings in such relation to each other and the object being treated (dental plates, as I employ the apparatus) that a ray of light entering one opening will be reflected by the object out of the other when at a proper temperature.

The openings might be provided with stopples to confine the heat in the chamber, except when observations are to be made.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. The herein-described muffle consisting of the two chambered parts A, B, the resistances therein, the insulating-base, the contact-springs, the binding-posts, and suitable means substantially as described whereby the current may be caused to traverse the resistances in series or multiple, substantially as described.

2. The herein-described muffle consisting of the parts A, B, each having an internal lining of refractory material, a chamber or cavity, and a resistance-coil substantially covering the entire surface of the cavity; the insulating-base, the contact-springs the binding-posts and electrical connections between said posts and the resistances, and suitable means whereby an electrical circuit may be established through said resistances, substantially as described.

3. An electrical muffle having an interior chamber, electrical heating-wires surrounding said chamber, and opposite openings through the walls of the muffle for the entrance and exit of light, said openings being at angles to each other, and all adapted for the purpose and constructed substantially as described.

4. An electrical muffle having an interior chamber, whose top, bottom, and side walls are substantially covered with resistance-wires, and having substantially opposite openings in its walls respectively for the admis-

sion of a ray of light, and for the exit of it when reflected, substantially as and for the purpose described.

5 The combination of a muffle having a plurality of resistances around its heating-chamber, and sight-openings substantially as described; with a switch and electrical connections whereby said resistances may be connected in series or multiple substantially as
10 described.

6. A muffle having a lower chambered part mounted on an insulating-base and provided with a resistance-coil; an upper part also chambered and provided with a resistance-coil; suitable means substantially as described, whereby a circuit may be established
15 through said resistances in series or multiple at the will of the operator, and the two substantially opposite sight-openings communicating with the interior chamber of the muffle,
20 for the purpose and substantially as described.

7. The combination of the muffle having upper and lower resistances, the plates F, G,

connected to said resistances, substantially
as described, the binding-posts, and the switch
H, carrying contact-button I, and flexible connection between said button and one binding-
post, all substantially as and for the purpose
set forth.

8. The combination with the two-part muffle, the resistance in each part, the insulating-base, the springs E, E' electrically connected with the upper resistance; the plates F, connected to spring E, the plate G connected to
35 post E' and the lower resistance, the binding-posts d, d' , the connections between the lower resistance and post d , the switch H connected with post d' , and the button I on switch H connected to post d' , all substantially as and
40 for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

LEVITT E. CUSTER.

Witnesses:

WILLIAM G. FRIZELL,
S. RUDOLPH LIGHT.