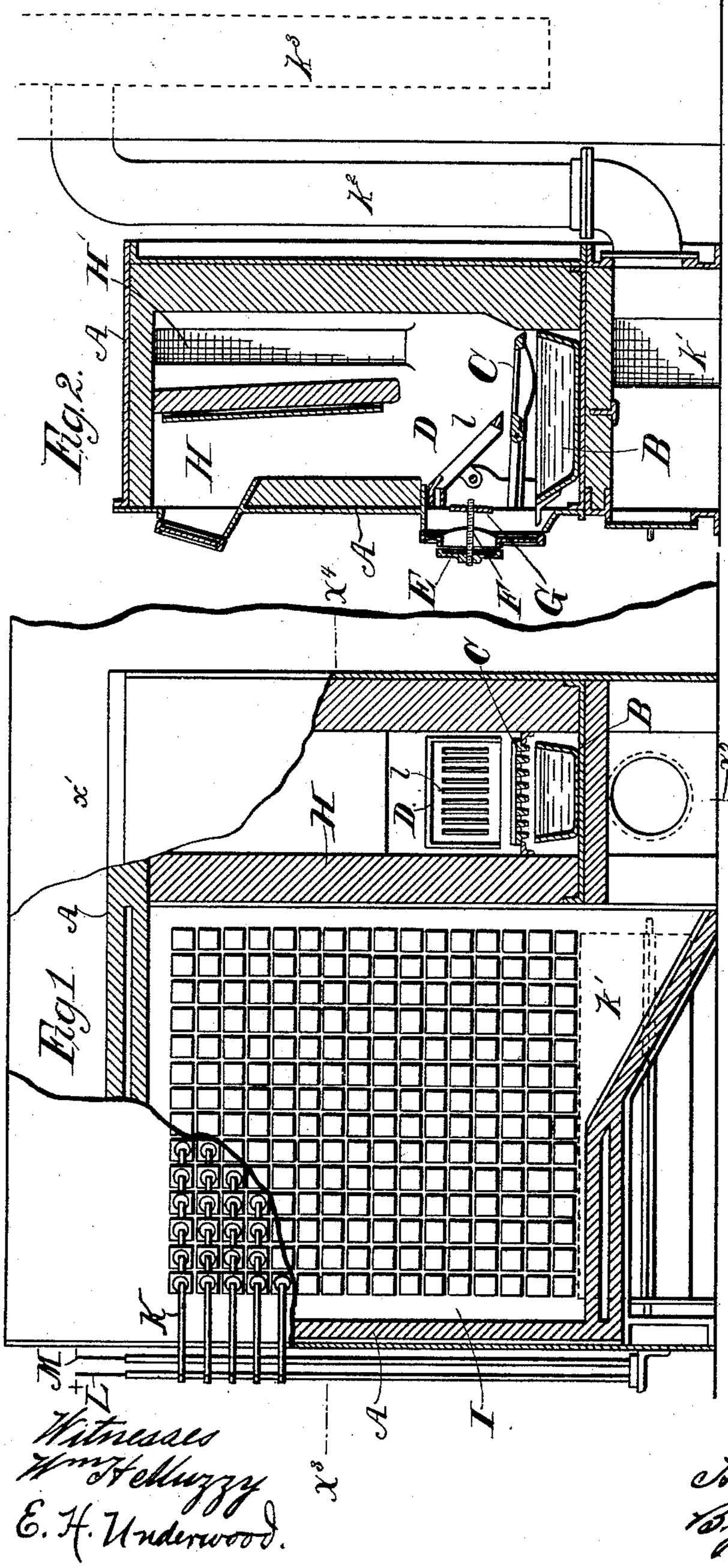
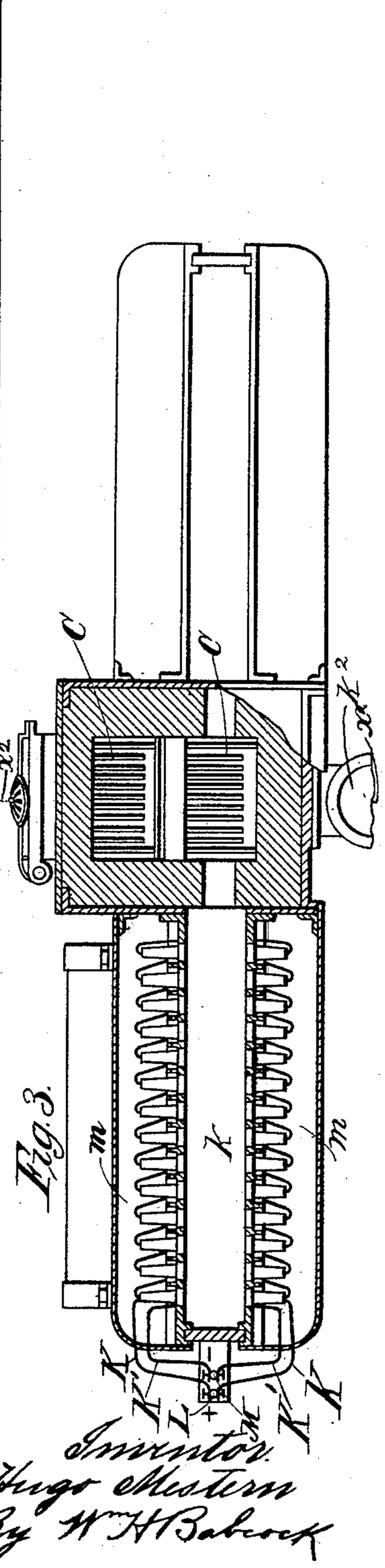
(No Model.) 2 Sheets—Sheet 1.

H. MESTERN.

THERMAL BATTERY.

No. 434,640. Patented Aug. 19, 1890.





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(No Model.) 2 Sheets—Sheet 2.

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Fig. 6.

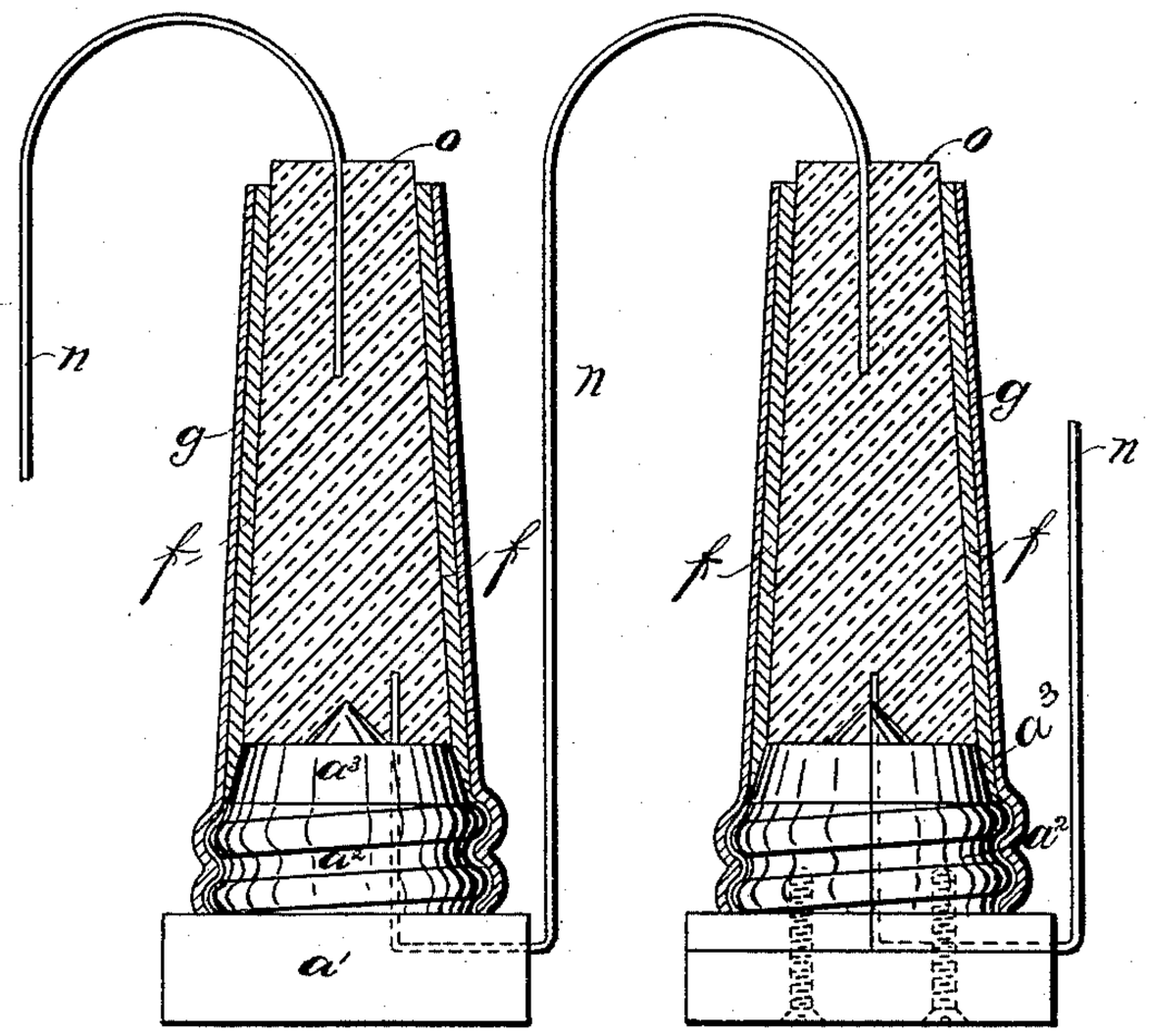


Fig. 12.

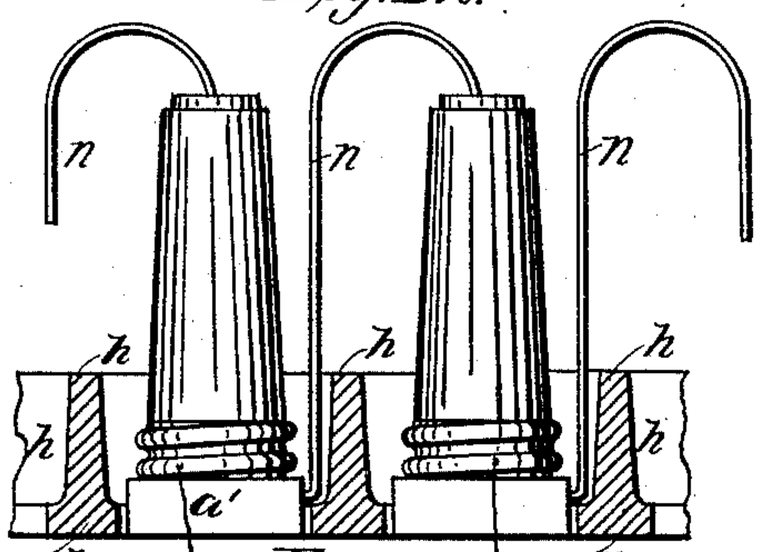


Fig. 4.

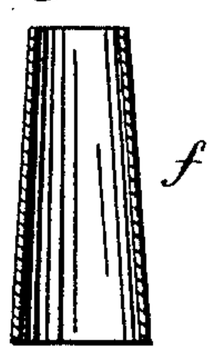


Fig. 5.

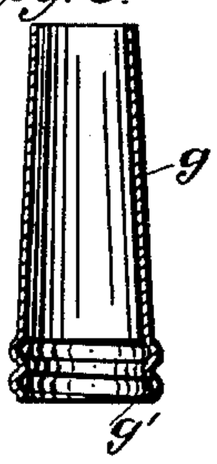


Fig. 7.

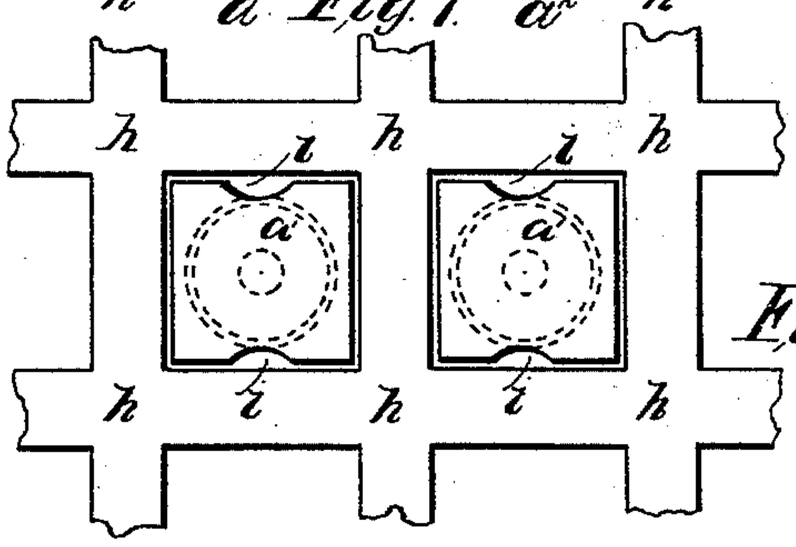


Fig. 8.

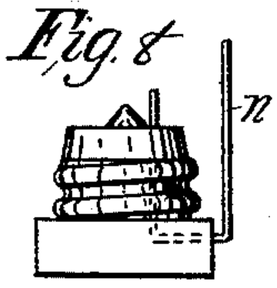


Fig. 9.

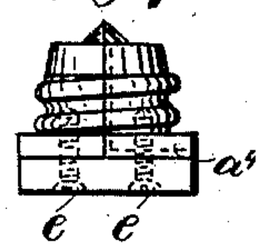


Fig. 10.

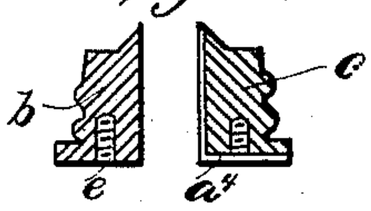
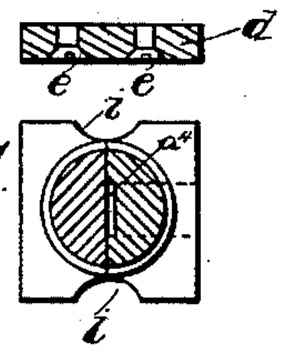


Fig. 11.



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UNITED STATES PATENT OFFICE.

HUGO MESTERN, OF MUNICH, GERMANY.

THERMAL BATTERY.

SPECIFICATION forming part of Letters Patent No. 434,640, dated August 19, 1890.

Application filed January 6, 1890. Serial No. 336,104. (No model.)

To all whom it may concern:

Be it known that I, HUGO MESTERN, a citizen of the Empire of Germany, residing at Munich, in the Kingdom of Bavaria, in said Empire, have invented certain new and useful Improvements in Thermo-Electric and Furnace Batteries; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object to improve the devices described and shown in British Letters Patent No. 2,259, of February 14, 1888. As set forth in the specification of said patent, the invention covered thereby is for the purpose of rendering the elements of thermo-electric batteries more capable of resisting high temperatures, thus obviating the various prejudicial effects otherwise attendant on their continued exposure to great heat. As therein explained, I have heretofore attained this end by the peculiar construction and combination of the elements and by their relation to the furnace and cylinder or tube, serving for the combustion of the fuel employed for actuating the battery.

Now, in order to admit of a more extended application of the principle of construction laid down in the specification referred to, I desire to point out that the combustion-cylinder contained in the furnace may be either a "basket-grating," as it is termed in the before-mentioned specification, or a perforated cylinder for the combustion of liquid or gaseous fuel, or the cylinder may be solid on its circumference, and be provided at the bottom with suitable inlets for supplying the liquid or gaseous fuel. The metallic deflecting-strips, which are preferably cast into the blocks or metal of the elements, may be made either of a piece of sufficient length to connect each two elements, or they may be made separate and joined by means of any screw or other suitable connecting device. These strips may, however, be laid in a channel in the center of the metal block, which is then formed in two halves, for the purpose as hereinafter explained.

As the best mode of securing the protective mantle surrounding the insulating-layer of each element to the metal block, I elect the following: That part of the metal block which is surrounded by the asbestus or other insulating-layer is made cylindrical or conical, so as to allow the insulating-tube, likewise made cylindrical, to be closely fitted over the same down to a shoulder, having a breadth equal to the thickness of the insulating-tube. The said shoulder forms the beginning or upper edge of another concentric cylinder for receiving the metal tube when shifted over the insulating-tube. This larger cylinder is provided with a suitable screw-thread from top to bottom, and the metal tube, having a corresponding screw-thread formed therein, is screwed over the cylinder, so as to tightly surround the same and obviate any penetration of fused metal. To increase the security against such penetration and insure an absolutely tight fit of the metal tube to the block, the screw-threads may be coated with asbestus or any other convenient packing material. In consequence of this screwed connection the asbestus will be pressed tightly down over the cone or cylinder. The screw-threaded portion of the block terminates at the shoulder part or base of the electro-positive element. This base is made square to provide greater heating-surface and facilitate the building up of the elements.

The thermo-electric batteries of my invention are applicable for producing heat and electric light, and also for galvanic, medicinal, and various other purposes.

I will now describe the invention with reference to the accompanying drawings.

Figure 1 is a vertical section with partly-shown front elevation. Fig. 2 represents a vertical section from front to rear on the line $x' x^2$ of Fig. 1. Fig. 3 represents a horizontal section on the line $x^3 x^4$ of Fig. 1. Fig. 4 represents in detail vertical section the hollow asbestus covering of one of the soft-metal electrodes. Fig. 5 represents a similar view of a conical case inclosing the same. Fig. 6 represents a vertical section, on a larger scale, of a pair of the elements with their covering, supports, and connections. Fig. 7 represents a plan view of a part of the supporting-frame. Figs. 8 and 9 are detail elevations of different forms of the metal block constituting one of the positive electrodes. Fig. 10 represents two detail sectional views of parts of

said positive electrodes, indicating the means of fastening their sections together and of attaching the conductor. Fig. 11 represents a horizontal section through one of the electrodes, also a vertical section of its base; and Fig. 12 represents a side elevation of two pairs of electrodes with their conductors, the cells containing them being shown in vertical section.

A designates the exterior wall of a furnace having within it a fire-chamber *l*, on the bottom of which is a receptacle B containing liquid fuel. Above the latter is a grate C, and obliquely above that a guard-grate D. In front of the latter there is a draft-outlet provided with a cover E, which is made adjustable by a screw F extending inward through a fixed plate G. By turning this cover and its screw the draft may be increased or diminished at will.

A partition H separates the fire-chamber *l* from the battery-chamber I, a passage H′ through said partition allowing the hot air to pass from the one chamber to the other.

As indicated in Fig. 3, there may be two or more fuel-receptacles with a corresponding number of grates. The pairs of electrodes, as shown in Fig. 3, are secured within rectangular recesses or apertures of one or more frames *h*, and are connected to each other by strips *n*, of conducting material, the final positive element of each series being connected by a conductor K to a circuit-wire L, and the corresponding negative element being connected in each instance by a conductor K′ to a circuit-wire M.

The negative electrode of the elements consists of a metal block (cast-iron or the like) composed of the square base a', with a screw-shaped part a^2, above which is a circular end piece a^3, terminating in the cone-point a^4. In this metal block is placed the conducting-strip *u*, either cast in, as shown in Fig. 8, or merely laid in the aperture a^4, as shown in Figs. 9, 10, and 11. In the latter case the negative electrode is formed in two parts *b* and *c*. The half *c* contains the aperture a^4 as an open channel extending straight down from the point to the bottom of a', and then passing sidewise out to the edge of *c*, as in Fig. 10. The flat conducting-strip a^4 is laid in the channel, and then *b* and *c* are brought closely together, so as to appear as one solid block. To the bottom of this block *b c* the plate *d*, Fig. 6, is screwed by the screws *e*, so that they cannot be separated, as shown in Fig. 9. After the negative electrodes are thus formed in one of these ways and are fitted with their conducting-strips, as shown in Fig. 6, a hollow asbestus covering sleeve or tube *f*, Fig. 2, is cemented onto the part a^3 of each electrode, and the conical case *g*, which is fitted with a female screw *g′*, is screwed over a^2 and a^3. Through the screwing of the case *g* over a^3 the asbestus block *f* has its lower end pressed firmly on the negative electrode, so that between the insulating-sleeve *f* and the parts a', a^2, and a^3 a complete junction is effected. If now a row of such screwed elements is formed, the negative electrodes are turned, as Fig. 6 shows, standing near each other vertically, so that the conducting-strips *n* have their upper curved part terminating in the middle of the neighboring positive electrode. Now the fluid metal of the positive electrode formed of some easily-fusible metal (antimony, zinc, or alloys) is poured into the opening of the asbestus tube *f* and the row of elements is ready.

It should be noticed that the elements as drawn are formed, preferably, of a conical shape, so that the positive electrode cannot fall out of its inclosure; but I claim the right to use a cylindrical or other form for the elements. It is also not necessary that the junction of the two electrodes should be effected in the precise manner before described; nor is it essential that the positive electrode should be firmly embedded, or that the negative electrode should be screwed together, as shown, since any suitable modification of these methods could be employed.

In order to place together a large number of elements for a furnace-battery, the frame *h* is employed, which is constructed with square apertures of a size to receive the square base a' of the negative electrode, care being taken to place a non-conducting substance between the elements and the frame *h*.

In order to fasten securely the base a' of the negative electrode in the aperture of the frame *h*, it is advisable to form recesses *i i* in the side of the base, Fig. 11. If then the base a' is coated with some suitable non-conducting cement—such as fire-clay and asbestus—and pressed tightly into the opening, the cement stopping lying in the recess *i* will hold the element securely, so that it cannot fall out of the frame *h*, while at the same time a sufficient isolation is obtained by the calking or packing of the cement, so that the fire-gases with which the negative electrode is being heated cannot penetrate.

In Figs. 1 and 3 will be seen how the single elements lie in the frame *h* and are connected to a battery. Two frames are placed near together, as in Fig. 3, so that the space *k* is formed between them for the reception of the fire-gases which flow from the fire-chamber *l*, placed before the battery.

In the drawings the fire-chamber *l* is so placed that the fire passes right and left into two flues, so that with one a double battery is heated. The fire-gases heat the ends of the negative electrodes and pass through the channel *k′* and the tube k^2 to the chimney k^8, Fig. 2. The positive electrodes are kept as cool as possible, and for this purpose the battery is covered with a metal case *m*, in which through a regulator cold exterior air is admitted, which ascends by means of a channel or tube, and can, if desired, be utilized for any other purpose.

Should the positive electrode, through the

heating of the furnace-battery, become melted at its point of connection with the negative electrode, no escape of the melted metal or alloy can occur, owing to the formation of the asbestus sleeve *f*, the screw a^2, and the protecting-mantle *g*, so that the possibility of any break down in the elements is out of the question.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a thermo-electric or furnace battery, a pair of electrodes, one of which is provided with screw-threads engaging similar threads on the casing or mantle of another electrode, substantially as set forth.

2. In a thermo-electric or furnace battery, an electrode having an asbestus covering and an exterior casing or mantle provided with screw-threads, in combination with another electrode, which constitutes the base for the former one and is screw-threaded to engage the threaded part of said casing or mantle, substantially as set forth.

3. In a thermo-electric or furnace battery, an electrode consisting of two sections and recessed to receive a conductor between them, said electrode being provided with fastening devices for holding the sections together and the conductor in place, substantially as set forth.

4. In a thermo-electric or furnace battery, in combination with the two sections *b* and *c* of an electrode and a conductor of electricity secured between them, a base-plate *d*, fastened to both of said sections, for the purpose set forth.

5. In combination with elements of a thermo-electric or furnace battery, a frame *h*, having a number of openings, each of which is adapted to receive one of said elements or pairs of electrodes, in order that the latter may be conveniently cemented there, substantially as set forth.

6. In a thermo-electric or furnace battery, a furnace having a fire-chamber and a battery-chamber with communication between them, in combination with a pair of frames arranged in said battery-chamber, leaving a space between them, in order that the negative elements supported in said frames may be conveniently subjected to a current of air of one temperature and the positive elements to a current of air of another temperature, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HUGO MESTERN.

Witnesses:
EMIL HENZEL,
EDW. W. MEALEY.