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G. H. COVE.

THERMO ELECTRIC BATTERY AND APPARATUS.

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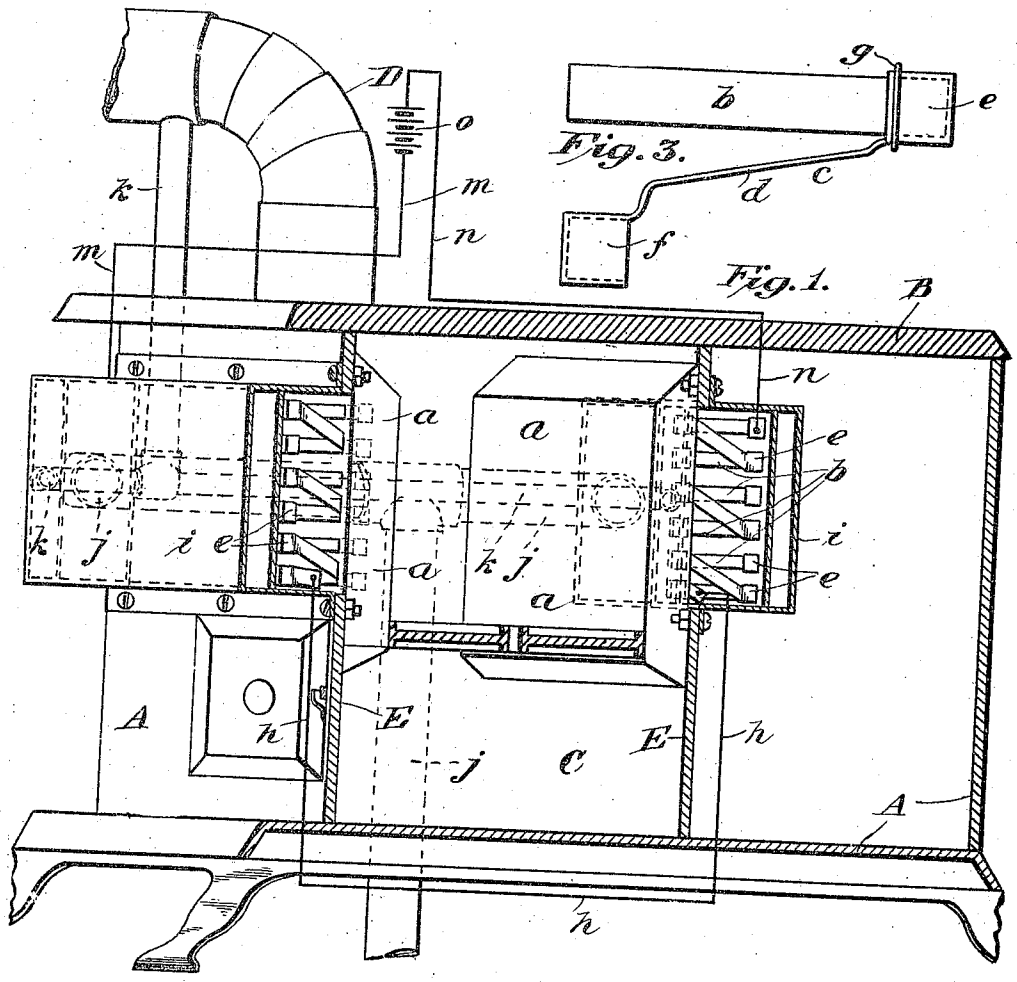

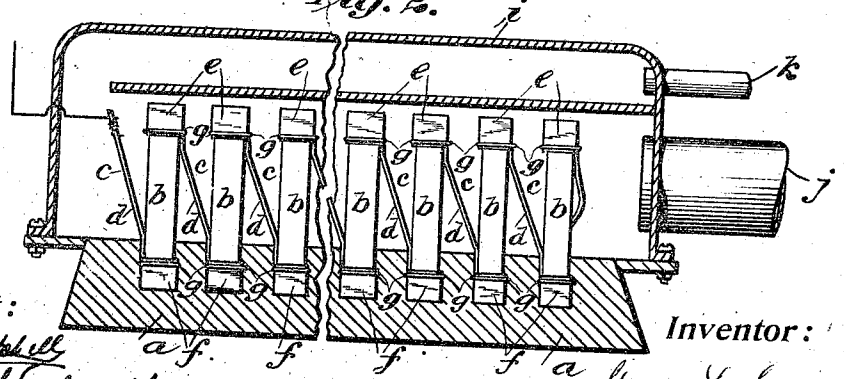

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UNITED STATES PATENT OFFICE.

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THERMO-ELECTRIC BATTERY AND APPARATUS.

No. 824,684. Specification of Letters Patent. Patented June 26, 1906.

Application filed February 15, 1905. Serial No. 245,653.

To all whom it may concern:

Be it known that I, GEORGE H. COVE, a subject of the King of the United Kingdom of Great Britain, residing at Roxbury, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Thermo-Electric Batteries and Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

The invention relates to thermo-electric batteries, and more particularly to the composition of the various elements and their arrangement with relation to the source of heat and each other. The underlying principles of batteries of this type are well-known in this art, and such will not, therefore, be referred to at length.

The object of this invention is to utilize these well-known principles in a manner to produce an external current capable of being employed advantageously in the useful arts.

A further object is to so arrange the various elements as to permit the subjection of one end or joint of each pair of elements to an intense constant heat, while permitting the other end or joint to be maintained at a relatively low temperature.

A still further object is to provide a junction or connection between the unlike elements which will preserve an intimacy of contact thereof each with the other without the interposition of such matter as would tend by setting up a local action to diminish the efficiency of the battery.

A still further object is to employ elements and junctions therefor of a character to cause or result in increased efficiency of the battery, and a still further object is to provide a battery and its appurtenances which may be readily applied to an ordinary cook-stove or heater in a manner to utilize that heat which might otherwise not be used.

The invention consists in those novel features in the arrangement of the various elements, in the means of joining or connecting same, and in the appurtenances employed to increase the efficiency of the battery, hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings, Figure 1 is a perspective view of an ordinary type of domestic range, showing a section of the fire-pot and of my battery and its appurtenances attached thereto. Fig. 2 is a horizontal cross-section of one portion of the battery and its appurtenances, and Fig. 3 is a view of a single pair of detached elements with the coupling or connection for electrically connecting succeeding pairs of elements.

Like letters refer to like parts throughout the several views.

In the drawings, A indicates an ordinary cook-stove or range; B, the top plate thereof; C, the fire-grate, and D the flue-pipe. The fire-box is provided with brackets E, adjoining said grate C, which are designed to carry the fire-bricks.

In the practice of my invention I employ a block *a* of fire-clay or similar non-combustible material, which is non-conductive of electricity. This block *a* is subjected to the action of the fire contained in the fire-pot either directly or through a metallic facing to said pot, and preferably I mix a fibrous non-combustible agent, as asbestos, with the body of said block to increase the cohesive strength thereof. Embedded in said block *a* are a plurality of what may be termed "negative elements" *b* and "positive elements" *c* arranged in pairs, one end of each pair of which extends within said block to a point about one-half an inch from the exposed face thereof and the other end of which projects from said block for from two-thirds to three-quarters of the length of the elements beyond the rear face thereof. These elements *b* and *c* are arranged in a plurality of parallel rows, those in each row being preferably about one-quarter of an inch apart and the rows being about one-half an inch apart. This arrangement serves to not only transmit heat to the ends or joints to be heated of the elements embedded in said block, but also to insulate said joints from each other, which permits the coupling of the elements in series without setting up local action between adjoining pairs of elements.

I have found in practice that the best results are attained by making each element *b* of an alloy of antimony and zinc in the following proportions: six parts of antimony to four of zinc.

In joining the various elements *b* and *c* of each row it has been demonstrated that considerable internal resistance will be developed

through an imperfect contact of the unlike metals of these elements and that a local action seems to be set up if said metals are soldered together, and, furthermore, owing to the effects of heat on the apparatus it has been found extremely difficult to secure an intimate contact or junction between these elements which will be reasonably permanent. To obviate these difficulties and to provide a substantially permanent connection or junction of the various elements without resorting to solder, I employ a second or positive element *c*, comprising, preferably, flat thin sheet metal, having the ends thereof formed upon opposite sides of a connecting-strip *d*, thus providing cups or caps *e f* conforming to the contour of the said element *b* and disposed on opposite sides of the connecting-strip *d*. An element *b* may be either driven, shrunk, or molded in one of these cups or caps *e f*, thus insuring intimate contact of these parts at the point of joinder. To guard against possible separation of the elements at this joint through the cup or cap *e f* losing form, a binding-wire *g* may be used to hold said cup or cap *e f* to form.

The positive element *c*, it will be observed, forms a heated joint with one negative element *b* paired therewith and a cold joint with the next succeeding element *b*, thus coupling all the elements of each row together. The element *c* of one end of each row passes to the end element *b* of the row above or below or is wired therewith, thus uniting all the rows in series.

I have found that copper, tin, and that alloy of nickel, copper, and zinc known commercially as "German silver" are suitable for forming the aforesaid element *c*, but that by using copper and German silver alternately as positive elements connecting the negative elements *b* I secure greater electrical efficiency than by the exclusive use of any one metal as the positive element.

When the battery is divided into a number of distinct parts, as by the use of two or more fire-bricks, I electrically connect these parts, as by a conductor *h*, between a negative pole of one part to a heated end of a positive element of a positive pole of the other part in the same manner as I employ for the succeeding rows, properly insulating said conductor from the stove structure.

In applying the blocks to a stove, heater, or range the projecting joints of said elements *b c* while protected by said block to some extent from the direct action of the heat are through heat conductivity and radiation liable to become so heated as to materially impair the efficiency of the battery, one of the recognized conditions of a battery of this character being that one end of each pair of elements be maintained at a low temperature relative to the other. To maintain a low temperature of the exposed outer joint of the elements *b c*, I house them in with a substantially air-tight casing or housing *i*, which is divided into two connecting-passages, one of which receives said joints and is in direct communication with a source of cooled or chilled air, as by an inlet-pipe *j*, and the other of which communicates with said first-mentioned passage and is provided with a discharge-pipe *k*, which is connected with the flue-pipe D or other means, inducing a continuous circulation of air through the channels within said housing or casing. The external current is drawn by the terminal wires *m n* from the cold ends of unlike metals of opposite poles of the battery, and a secondary battery, as *o*, of ordinary construction is used to accumulate the energy generated in my said battery.

Experiment has demonstrated that a battery of six joints will develop a current of three volts and three amperes, and that by a multiplication of elements this external current may be increased proportionately to the number of elements and joints employed. I have also ascertained that the use of solder in making a joint not only results in a joint which lacks the desired permanency under heat, but that the third metal or alloy tends to set up a local action or otherwise impair the efficiency of the battery. I have also determined that the use of the alloy in the negative metal and of the alternating positive metals, as herein described, both increase the efficiency of the battery.

While, properly speaking, the unlike elements are neither "positive" or "negative," I employ these terms as designating the general direction of the flow of current generated.

A battery and its appurtenances as herein described is capable of generating a continuous electrical circuit by means of that heat ordinarily lost through radiation, which may be stored during a number of hours in sufficient quantities to maintain low-potential high-efficiency incandescent electric lamps for a considerable period, to supply an extensive electric signaling system, and various other practical purposes.

It is not my intention to limit the invention to the precise details hereinbefore described, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described the invention, what I claim as new, and desire to have protected by Letters Patent, is—

1. A thermo-electric battery and appurtenances, comprising a block of incombustible, non-conductive material, a plurality of pairs of elements of dissimilar metals having one end of each joined to the other and embedded in said block, the outer end of each said element being joined to a dissimilar adjoining element whereby a series of such

elements is formed, means circulating air about the projecting ends of said elements, means whereby said blocks are subjected to continuous heat, a secondary battery and connections between the dissimilar terminal elements of said series and the opposite poles of said secondary battery.

2. A thermo-electric battery and appurtenances comprising a block of incombustible, non-conducting material, a plurality of pairs of elements each comprising respectively a connecting-strip having on opposite sides at each end of and integral therewith, a cup or cap, and a dissimilar metal element having one end thereof fitted into one of said cups or caps and in a similar cup or cap of an adjoining pair of elements whereby a series of such elements is formed, binding-wires about said cups or caps, one end of all said elements being embedded in said block, terminal wires leading from dissimilar elements of said series, and means whereby said block is subjected to continuous heat.

3. A thermo-electric battery and appurtenances comprising a block of incombustible, non-conductive material, a plurality of pairs of elements of dissimilar metals having one end of each joined to the other and embedded in said block, the outer end of each said element being joined to a dissimilar adjoining element whereby a series of such elements is formed, a housing or casing inclosing the projecting ends of said elements, an air-inlet to said casing or housing communicating with a source of cold-air supply, a discharge-pipe for said casing and means circulating air through said casing, said inlet and said discharge-pipe, means whereby said block is subjected to continuous heat, and terminal wires leading from dissimilar elements of said series.

4. A thermo-electric battery and appurtenances comprising a heater, a fire-pot and a flue therefor, a block of incombustible, non-conductive material disposed about said fire-pot, a plurality of pairs of elements of dissimilar metals having one end of each joined to the other and embedded in said block, the other end of each said element being joined to a dissimilar adjoining element whereby a series of such elements is formed, a casing or housing comprising two connecting passages one inclosing the projecting ends of said elements, an air-inlet in this passage communicating with a source of cooled air, a discharge establishing communication between the other passage and said flue, and terminals to two dissimilar elements of said series.

5. A thermo-electric battery and appurtenances comprising a block of incombustible, non-conductive material, a series of pairs of elements comprising a plurality of dissimilar metal elements, and a plurality of metal elements connecting said elements successively, said connecting elements all being dissimilar to said first-mentioned elements and to the next adjoining connecting element, means whereby said block is subjected to continuous heat and terminals leading from dissimilar elements of said series.

6. A thermo-electric battery and appurtenances comprising a block of incombustible, non-conductive material, a series of pairs of elements comprising a plurality of elements formed of an alloy of antimony and zinc, and a plurality of elements connecting said antimony and zinc elements, said elements connecting said first-mentioned elements being alternately of copper and of an alloy of nickel, copper and zinc.

In witness whereof I have hereunto affixed my signature, this 9th day of February, 1905, in the presence of two witnesses.

GEORGE H. COVF

Witnesses:
ELI SHELDON,
JOSEPHINE MORAN.