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THERMOPILE ELEMENTS.

APPLICATION FILED JULY 6, 1903. RENEWED JULY 6, 1904.

NO MODEL.

Fig. 1.

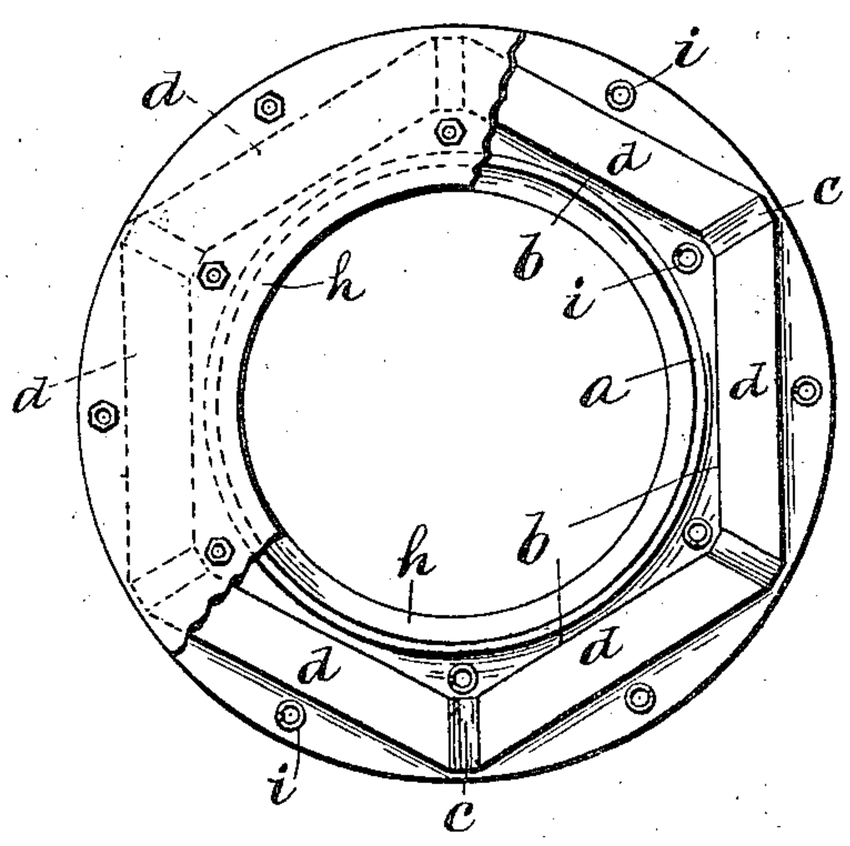
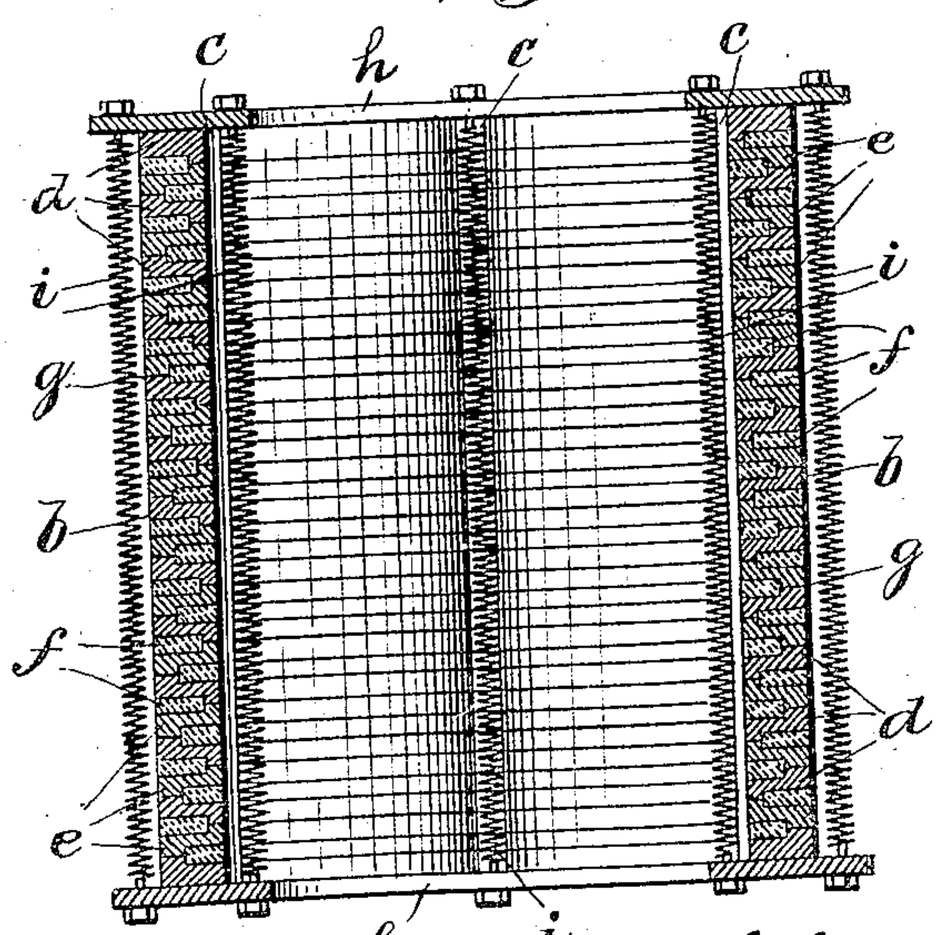


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN A. LYONS AND EDWARD C. BROADWELL, OF CHICAGO, ILLINOIS.

THERMOPILE ELEMENTS.

SPECIFICATION forming part of Letters Patent No. 775,188, dated November 15, 1904.

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To all whom it may concern:

Be it known that we, JOHN A. LYONS and EDWARD C. BROADWELL, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Thermopile Elements, of which the following is a specification.

Our invention consists in the substitution of bars or pieces of solid metallic salts or true inorganic chemical compounds for the metals or alloys heretofore used in the construction of thermopiles. In practice we use suitably electrically conductive and difficultly-fusible bars each consisting of a mixture of the metallic phosphids, arsenids, borids, silicids, sulfids, selenids, or tellurids, a sufficient amount of the non-metallic element having been melted and combined with the metal or metals, the resulting salts of which are used to completely convert the metal or metals into true inorganic chemical compounds or mixtures of these compounds and destroy the well-known physical properties of the metals used.

While we are aware that galena has been used with metallic iron and copper sulfid with German-silver alloy, the chief object of our invention is to obviate the use of metals or alloys, and thereby the annoyance due to unequal expansion and contraction.

In carrying out our invention in one embodiment thereof alternate bars or plates of a mixture of iron sulfid with lead sulfid having these salts in about equal proportions are used in conjunction with bars or plates of copper phosphid to which an excess of phosphorous has been added during its formation to insure complete conversion of copper to copper phosphid and to which varying proportions of copper sulfid or tin tellurid may be added, these bars or plates being arranged in any well-known manner to receive energy from a source of heat.

For a full description of the invention and the merits thereof and also to acquire a knowledge of the details of construction and of the means for effecting the result reference is to be had to the following description and drawings hereto attached.

While the essential and characteristic features of the invention are susceptible of modification, still the preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 shows a plan view of the thermopile with the upper collar partially broken away, and Fig. 2 shows a vertical section of Fig. 1 with the central cylinder removed.

Corresponding and like parts are referred to in the following description and indicated in both views of the drawings by the same reference characters.

Referring to the drawings, *a* represents a cylinder, which may be formed from an iron or other suitable metallic pipe-section, capable of radiating heat to the thermopile elements which are placed about it. These elements, consisting of the metallic compound bars heretofore described, are assembled about the central cylinder in a number of separate banks or piles *b*, insulated from each other by vertical strips of asbestos *c* and which may be connected up in series or parallel with each other, as may be desired. In the drawings six banks of elements are used; but we do not limit ourselves to this specific number. As shown in Fig. 2, *d d* represent the positive elements and *e e* the negative elements, each being so shaped and formed that a horizontal layer of asbestos *f f* may be placed between them, leaving, however, a portion, as at *g g*, for purpose of contact between the two. At both the top and bottom of the apparatus is placed a collar or annulus *h*, of heavy glass, porcelain, or other suitable non-conducting material, which is of sufficient width to overlap the cylinder *a* with its inner edge and the outer angles of the polygons formed by the banks of thermopile elements with its outer edge. These collars are drawn tightly together by means of coiled springs *i i* of sufficient strength and suitable length to insure a good contact between the contiguous positive and negative bars of the thermopile when the parts are assembled as shown. These springs are preferably spaced around the collars on both the outside and inside of the banks of elements and when in position act in a similar manner as the means for tightening drum-heads. In practice the

central cylinder is heated red-hot by any suitable and convenient means and heat is radiated therefrom to the inside edges of the bars.

While these bars give excellent results, many other combinations of bars of two or more different chemical compounds have been tried and found useful, and therefore having discovered the possibility of doing away with the use of metals or alloys thereof in thermopile construction for the source of an electromotive force we do not limit ourselves to any given chemical salts or inorganic chemical compounds, since we differ from all invented heretofore by the disuse of metals or their alloys.

Having described our invention, what we claim is—

1. A thermopile having bars or plates of chemically-dissimilar compositions, possessing electrical conductivity, each composition consisting of a mixture of chemically-dissimilar inorganic compounds, substantially as described.

2. A thermopile having negative and positive elements, one composed of a mixture of iron sulfid and lead sulfid and the other of a mixture of a copper phosphid and another dissimilar metallic salt, substantially as described.

3. In a thermopile, the combination of bars or pieces each composed of mixtures of any two or more chemically-dissimilar salts, said bars of any configuration, possessing electrical conductivity of the first order, and assembled in any suitable manner to allow of maintaining a difference of temperature at their ends in order to establish and maintain an electromotive force.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHN A. LYONS.
EDWARD C. BROADWELL.

Witnesses:
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