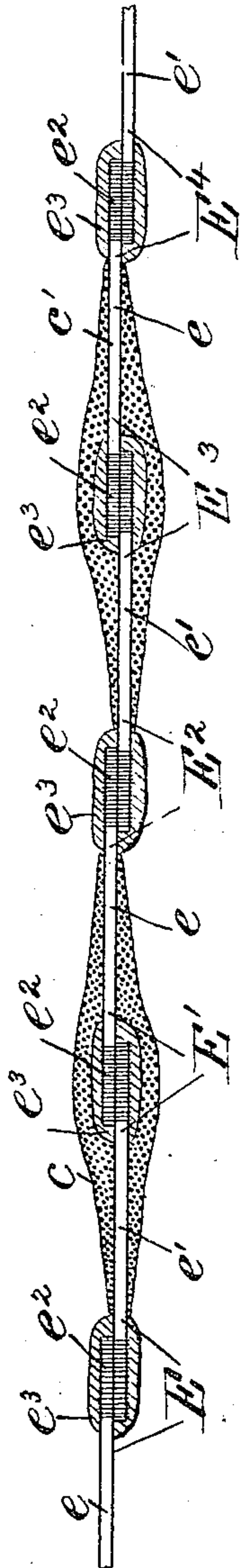


(No Model.)

E. W. JUNGNER.  
THERMO ELECTRIC BATTERY.

No. 521,168.

Patented June 12, 1894.



Witnesses  
*Henry Orth*  
*H. G. Winterich*

Inventor  
*Ernst W. Jungner*  
by *Henry Orth*



# UNITED STATES PATENT OFFICE.

ERNST WALDEMAR JUNGNER, OF SKARA, SWEDEN.

## THERMO-ELECTRIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 521,168, dated June 12, 1894.

Application filed March 9, 1894. Serial No. 502,990. (No model.)

*To all whom it may concern:*

Be it known that I, ERNST WALDEMAR JUNGNER, a subject of the King of Sweden and Norway, and a resident of Skara, in the Kingdom of Sweden, have invented certain new and useful Improvements in Thermo-Electric 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention has relation to thermo-electric chain batteries, and has for its object a construction of chain battery more particularly adapted for use with electric fire alarms, but may also be used for other purposes.

Referring to the accompanying drawings which illustrate by a longitudinal sectional view a portion of a thermo-electric chain battery embodying my invention, E, E', E<sup>2</sup>, &c., indicate the elements of the battery each composed of two strips or pieces, preferably wires, *e* and *e'* of different metals, as for instance, copper and iron wires connected in series by overlapping the ends of two wires of different metals *e e'*, binding them together by means of a good conductor of electricity, as for instance, fine iron wire, *e<sup>2</sup>*, and then completing the joint by brazing or soldering, as shown at *e<sup>2</sup>*. The alternate joints of the elements E' E<sup>3</sup>, &c., of the chain battery are suitably insulated by means of a non-conductor of heat, and I have found that excellent results are obtained by winding the said joints with cotton or cotton thread or yarn, as shown at *c, c'*, and in practice I preferably insulate the whole of the elements with the exception of the joints on opposite sides of the one that is insulated, as shown.

The length and diameter of the metal strips, pieces, or wires *e e'* may be greatly varied according to the uses made of the chain, especially when it is not desirable or necessary to obtain the best possible results with the least number of elements, since the resistance increases with the length of the element wires, the effect produced being correspondingly reduced. On the other hand, if the wires of the elements are too short the transmission of

heat from the naked to the insulated joints is too rapid, or, in other words, the battery is excited by too slight a variation in the temperature of the ambient air, from the normal.

I have found that when the thermo-electric chain battery is to be used in connection with electric fire alarms, excellent results are obtained by using copper and iron wire of a diameter of about one to 1.5 millimeters, and of a length of about forty to fifty millimeters, thus forming elements of from seventy to eighty millimeters, or from fifteen to twenty elements to the running meter of chain.

Inasmuch as iron is not as good a conductor of heat as copper, I prefer to use iron wire of greater diameter but shorter than the copper wires. In order that the best results may be obtained the extent of the insulated portions of the chain battery should be suitably proportioned; if, for instance, the layer of insulating material is too thick, the battery will be energized by comparatively slight changes, in the temperature of the ambient air from a normal temperature; if, on the other hand, the layer of insulating material is too thin, the thermo-circuit is correspondingly weakened, in fact, becomes too weak and of too short a duration for practical purposes. These difficulties are effectually overcome by winding the joints in the form of a spindle, the layer of insulating material being thickest at the joint, and is gradually reduced in thickness from said joint toward or to the joints on opposite sides, as shown.

If a thermo-electric chain battery constructed as described, is exposed to a rapid change of temperature of sufficient intensity an electric current will be generated in the one or the other direction, which current continues until the naked as well as the insulated joints are of the same temperature, provided of course the ends of the chain are in conductive connection. The current generated is however too weak to perform useful work, as for instance, produces an audible or visible signal, or both, in a fire alarm system, and I connect the same for such purposes with a sufficiently sensitive apparatus, such as a circuit controlling device, through the medium of which a battery circuit including alarm devices, is either closed or interrupted to give an alarm. For such purposes the chain bat-



tery may, for instance, be arranged along the moldings of a wall near the ceiling, and will remain unaffected except by a rapid and sufficient rise in the temperature of the ambient  
5 air, such as would be caused by the breaking out of a fire.

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

10 1. A thermo-electric chain comprising elements composed of two strips or pieces of different metals, said elements connected in series, the strips or pieces of one kind of metal alternating with those of the other kind and  
15 having alternate joints insulated by means of a non-conductor of heat, for the purpose set forth.

20 2. A thermo-electric chain, comprising elements composed of two strips or pieces of different metals, said elements connected in series, the strips or pieces of one kind of metal

alternating with those of the other kind and having alternate joints insulated by means of a non-conductor of heat, said insulation being of greatest thickness at the joint and decreasing in thickness in opposite directions. 25

3. A thermo-electric chain, comprising alternate overlapping pieces or strips of different metals, as alternating copper and iron wires, the overlapping portions united by  
30 means of a conductor of electricity as fine iron wire and by brazing or soldering, and having its alternate joints insulated by means of a non-conductor of heat, for the purpose set forth. 35

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ERNST WALDEMAR JUNGNER.

Witnesses:

A. J. HOLMBÄCK,

JOH. GEV. BUTSCH.