

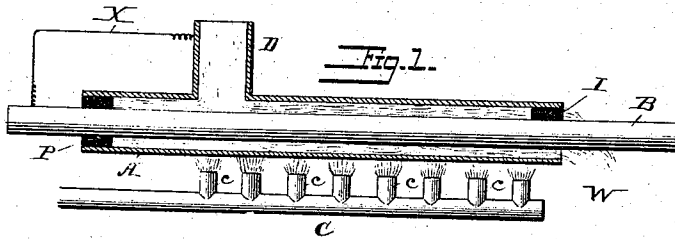
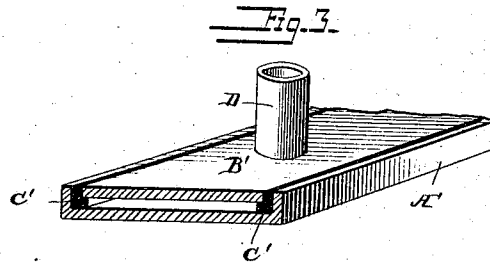
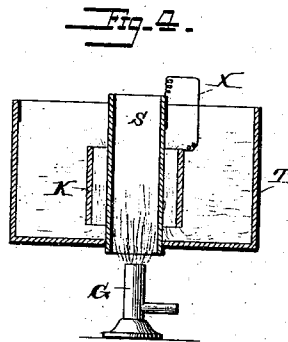
(No Model.)

E. G. ACHESON.

THERMO ELECTRIC GENERATOR.

No. 375,243.

Patented Dec. 20, 1887.



Witnesses

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THERMO-ELECTRIC GENERATOR.

SPECIFICATION forming part of Letters Patent No. 375,243, dated December 20, 1887.

Application filed September 2, 1887. Serial No. 248,632. (No model.)

To all whom it may concern:

Be it known that I, EDWARD G. ACHESON, a citizen of the United States, and a resident of Pittsburg, Allegheny county, Pennsylvania, have invented certain new and useful Improvements in Thermo-Electric Generators, of which the following is a specification.

In thermo-electric generators heretofore constructed it has been customary to place a couple or a series of couples of conductors separated in the thermo-electric series as much as possible in contact with each other, to heat one portion of the couple or couples artificially and to allow the other portions to cool either by radiation or to be cooled by the application of some cooling agent. The difference of temperature between the two portions thus obtained was necessarily very low, and the electro-motive force of the current yielded by an apparatus of this kind was necessarily small.

In all attempts which have been made to produce electric currents with a combination of solids and liquids it has been found that, although the currents obtained may, at the first moment of heating one of the conductors, be of considerable strength, it rapidly falls, owing to the formation of gases upon the surfaces of the solids and to other peculiarities in the investing fluid, as set forth by Faraday.

It is the object of my invention to construct a thermo-electric generator in such a manner as to avoid these objections and to increase and maintain the difference of temperature between the two thermo-electric elements, and consequently to increase the electro-motive force of the current generated. I accomplish this object by separating the two thermo-electric elements by a moving conducting-fluid and by applying heat directly to one of the elements, whereby the temperature of the other element can never rise above the boiling-point of the conducting-fluid which separates it from the first. It will now be understood that, while one of the elements to which the heat is directly applied may be raised to a comparatively high temperature, the other element will be comparatively cool, and that consequently a current of considerable tension will be produced in the exterior circuit of such couple. The movement at the sur-

faces of contact between solids and fluid will prevent the accumulation of gases on their surfaces, and consequently avoid a drop in the strength of the current. This is the fundamental idea of my invention, and in the following detailed description of the same reference is made to the accompanying drawings, in which several of the numerous forms which my invention may assume are illustrated. My invention, however, is not confined, either generically or specifically, to the apparatus herein shown and described, but it includes and embraces the mode of operation therein involved.

In the drawings, Figure 1 represents a side elevation, partly in section, of one form of my apparatus; Fig. 2, a cross-section of a detail of construction; Fig. 3, a perspective view, partly in section, of a modified form; and Fig. 4, a sectional elevation of another form of my improved thermo-electric generator.

Referring now more particularly to Figs. 1 and 2, I have there shown a tube or pipe, A, of some conducting material, and a rod, B, of either the same or another kind of conducting material, passing centrally through the tube, and held separated from the walls of the same by a tightly-fitting washer, P, at one end and an annular web, I, at the other end. Both the washer and the annular web are made of some refractory insulating material, which is also a poor conductor of heat, like asbestos, clay, &c.

Near one end of the tube A an opening is produced in the same, which communicates, by a tube, D, or otherwise, with a source of water or other conducting-liquid, so that the water coming from this source aforesaid will pass into the tube A, filling the same and discharging at the annular web I. Thus it will be seen that the rod B will be surrounded on all sides by the conducting-fluid employed, but will otherwise be insulated from tube A.

C is a gas-pipe placed parallel below tube A, and a number of gas-jets emerging from burners c c c c c will heat tube A to any desired degree. The heat thus imparted to tube A will in turn heat the conducting-fluid within the same, which in turn will impart its heat to the rod B; but it is a known law of physics that fluid having a surface exposed to the atmosphere can never be heated beyond a tem-

perature at which said fluid boils, for every additional increment of heat is at once consumed in the production of steam or vapor, which, when the surface of the fluid is open to the atmosphere, will escape.

In the apparatus here shown, if in place of the annular web I a tight washer were used, the fluid filling the tube A would be heated up to its boiling-point, but could never be heated beyond that point, and the temperature of rod B would therefore reach its maximum when the boiling-point of the fluid is reached, while the tube A may be, and in the nature of things will be, much hotter without imparting additional heat to the rod B; but in the construction herein shown, where the fluid entering the tube A by the pipe D is allowed to discharge at W, the temperature which said fluid can attain will be necessarily much lower than that of the boiling-point of the same, and the difference of temperature between tube A and rod B will therefore be very great. If, now, the rod and the tube be connected by an external circuit, X, a current of considerable tension will discharge into the same and will be maintained as long as the difference of temperature is maintained. The moving liquid carries with it the steam or gas developed, preventing the drop of electrical potential due to the adhesion of the gases to the surfaces of the elements which might otherwise take place. It will be clear that any number of thermo-electric generators constructed upon this principle may be connected in series, and will then furnish a current of any desired tension.

In Fig. 3 a modified form of my apparatus is shown. In place of tube A, as shown in Fig. 1, I here employ a trough, A', of conducting material, and upon insulating-ledges C' C', of refractory material, is placed a cover, B', of the same or another kind of conducting material of which the trough is made. The tube D communicates with the space inclosed by the trough and cover, and the conducting-fluid employed enters the trough by said tube in the same manner as indicated in Fig. 1, and said fluid is allowed to discharge at one end of the trough, while the other end is hermetically sealed by refractory insulating material in the same manner in which tube A in Fig. 1 is closed by washer P. The heat in this instance is applied directly to the bottom of trough A'. The conducting-fluid is thereby heated and imparts its heat to cover B', the temperature of which can, as will now be understood, never be higher than that of the conducting-fluid, but will ordinarily be lower than that on account of its exposed upper radiating-surface.

Another modification is shown in Fig. 4. Here there is a vessel, T, of any suitable material, which is filled or partly filled with a conducting-fluid. A tube, S, passing through the center of the vessel and rising above the same, is open at both ends, and is surrounded by another wider tube, K, separated from tube

S on all sides and entirely immersed in the conducting-liquid. The tubes S and K are made of suitable conducting material, and a gas-burner, G, or any other source of heat is placed under the vessel T, with its flame passing into tube S, heating the same to any desired extent, while, as will be understood, tube K will be maintained at a much lower temperature, governed by the boiling-point of the conducting-fluid employed. The current generated is utilized in the external circuit X, as in the constructions hereinbefore described. In this form of apparatus the heat from the bottom of the vessel will pass in a great measure between the two tubes S and K, causing the cooler portions of the fluid from the surface to pass down toward the bottom to replace the displaced other portions. Thus a continuous upward current of fluid will be maintained within this annular space between the two tubes S and K.

The fundamental part of my invention may be incorporated in numerous apparatus widely different in form and construction from those herein shown and described, and it will be understood that I am not limited to any particular form, nor to any particular material, nor to any particular source of heat, for it is quite practicable to select among the conductors suitable to the construction of my apparatus such as stand on the same or on different scales of the thermo-electric tension series, and as a fluid conductor any one having a comparatively low boiling-point may be employed with advantage; nor do I confine myself to the particular means for establishing current of conducting-fluid between the thermo-electric elements, since it is of no consequence how such current is established and maintained, if used at all.

Having now fully described my invention, what I claim is—

1. The method of producing a difference of electrical potential between two solid conductors, which consists in heating one of them directly and conveying the heat from the same to the other by a moving fluid conductor, substantially as described.
2. The method of producing a difference of electrical potential between two solid conductors, which consists in heating one of them to any desired degree and maintaining the temperature of the other at or below the boiling-temperature of a moving conducting-fluid, substantially as described.
3. The method of generating a thermo-electric current, which consists in applying heat directly to one of the thermo-electric elements and by passing a current of a conducting-fluid between the same and the other thermo-electric element, substantially as described.
4. A thermo-electric battery consisting, essentially, of two thermo-electric elements separated from each other by a moving conducting-fluid, and a source of heat applied to one of said elements, substantially as described.
5. In a thermo-electric battery, the com-

5 bination of a thermo-electric element and a source of heat acting directly upon the same with a second thermo-electric element immersed in a moving fluid conductor and separated from the first element by said fluid conductor, substantially as described.

In testimony whereof I have signed my name

to this specification in the presence of two subscribing witnesses.

EDWARD G. ACHESON.

Witnesses:

GEO. F. McCOMBS,
M. F. CASSIDY.