

(No Model.)

W. MITCHELL.  
ELECTRIC STEAM GENERATOR AND HEATER.

No. 457,362.

Patented Aug. 11, 1891.

Fig. 2.

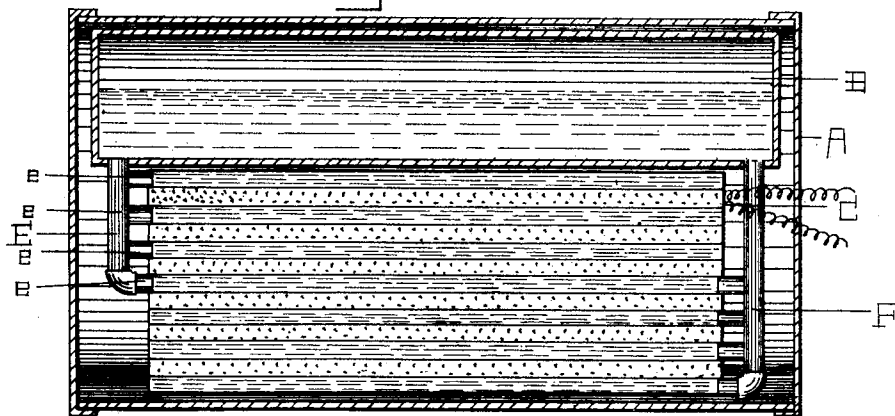


Fig. 1.

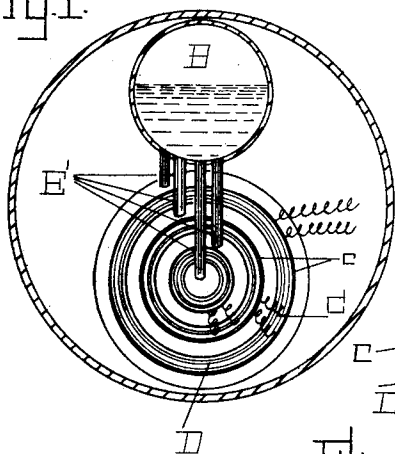


Fig. 3.

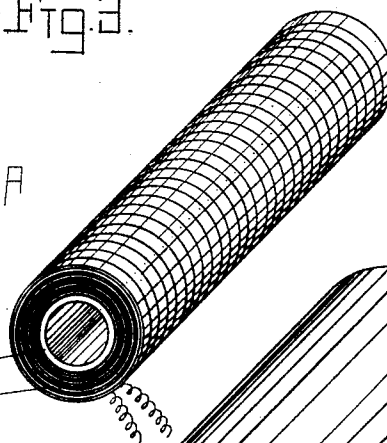
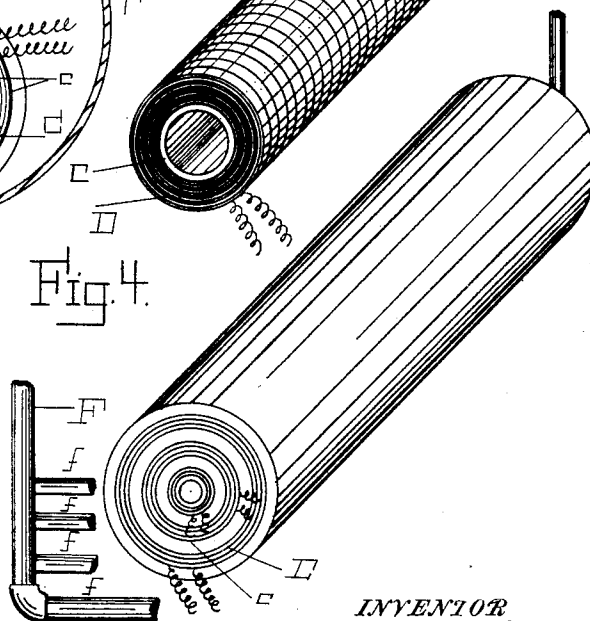


Fig. 4.



WITNESSES

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## ELECTRIC STEAM GENERATOR AND HEATER.

SPECIFICATION forming part of Letters Patent No. 457,362, dated August 11, 1891.

Application filed November 29, 1890. Serial No. 373,087. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIS MITCHELL, a citizen of the United States, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Electric Steam Generators and Heaters; 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.

The object of this invention is to generate steam by electricity more quickly and cheaply than in the electric steam-generators heretofore employed and in such volume as to answer the purposes of an ordinary engine-boiler. To this end I employ the construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 represents a transverse section of a steam-generator embodying my invention. Fig. 2 represents a longitudinal vertical section of the same with slight modifications. Fig. 3 represents a detail view of the heating-cylinder with its outer covering removed, so as to expose the exterior wire; and Fig. 4 represents a detail view of said heating-cylinder covered and of the outlet-pipe shown in Fig. 1, the two being slightly separated.

A designates the boiler or steam-generator casing, which is of the ordinary cylindrical form; B, a reservoir for water arranged in the upper part of the interior space of said boiler or steam-generator, and C an electric heating device consisting of concentric hollow cylinders *c*, preferably of asbestos, on all of which, except the outer one, the heating-wire D is wound. In winding, the coils or spirals are prevented from touching each other, every wire being in the space of ten or twelve, more or less.

The method of putting together the electric heating device is to wind the wire, after the fashion above stated, on the innermost cylinder, then to slip over said cylinder and the wire thus wound the second cylinder, then to wind said wire back on the latter, and so to continue until the last cylinder or covering-layer is reached. This acts as a jacket

for all. The ends of the wire extend out from one end of the heating device and form part of an electric circuit. The spirals or coils of said wire do not fill the spaces between the cylinders or layers *c*, which are mainly reserved for the water that is to be heated. The ends of said heating device are closed; but communication is made between reservoir B and the spaces between layers *c* by an inlet-pipe E, Fig. 1, having several branches *e* or several independent pipes E', Fig. 2, and an outlet-pipe F. The said inlet-pipes E', Fig. 2, extend down from one end of reservoir B and enter independently the said spaces between cylinders *c*, one pipe going to each space, as shown, above the center of the cylindrical heating device, or the branches *e* of the downwardly-extending pipe E, Fig. 1, likewise enter said spaces. From the other end of said heating device branch pipes *f* extend in like manner, but from the lower part of each space to the main outlet-pipe F aforesaid. This leads up to the other end of reservoir B. The circuit of the water is from one end of said reservoir through pipes E and *e* or E' to each of said spaces, and then through these latter and out by way of branch pipes *f* and main pipe F to the other end of said reservoir. The circuit of the electric current in the wire is into the heating device near the center, thence around the cylinders *c* successively, except the exterior one, and finally out again, a generator and outside conductors completing it, or it may be reversed, entering at the outside of the heater and escaping near the center. The wire is preferably coated with insulating material, though this is not necessary if care be taken in winding. The heating action is not wholly due to the resistance of the wire, for I have discovered that when wound at such intervals as stated a very great calorific effect may be produced in the inclosed spaces without greatly heating the wire itself. This action I am not able to explain, it being one of those subtle and mysterious electrical phenomena, perhaps allied in nature to induction, of which, except by their results, we as yet know very little. In the present instance these results are undoubted, recurring constantly in practice. I am able

to handle the wire spirals without burning my fingers when the heat at the end of the inclosed spaces would be simply unendurable. Of course the wire may be wound in this way  
 5 on a single cylinder or layer or core instead of winding it successively on a series of such cylinders, as stated. In that case the heating device would not be so well suited to the particular use here specified; but either a  
 10 heating-cylinder of one layer thus prepared or one of several layers, as above described and shown, may be made use of whenever calorific action is needed.

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

1. In a steam-generator, the combination of  
 20 a water-reservoir with a heating device consisting of a series of layers alternating with water-spaces, a wire forming part of an electric circuit and wound on said layers within  
 said spaces, and inlet and outlet pipes connecting said heating device and reservoir, substantially as and for the purpose set forth.
- 25 2. In combination with reservoir B, the concentric hollow layers c, leaving water-spaces

between them which are closed at the ends, the wire D, wound on said layers within said spaces and forming part of an electric circuit, the inlet-pipes E, extending from one  
 30 end of said reservoir independently to said spaces at one end of the heating device, and the outlet-pipe F, having branches f, whereby the water passes from the other end of said  
 35 heating device to the said reservoir, substantially as set forth.

3. A heating device consisting of a core of successive layers and a wire wound thereon, forming part of an electric circuit, the winding being such that each wire coil or spiral is  
 40 separated considerably from the others and is located in a space about ten times its own width, more or less, according to the service required, in order that said wire may generate a heat in excess of the heat of resistance,  
 45 substantially as set forth.

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

WILLIS MITCHELL.

Witnesses:

P. R. TRIPP,

WILLIAM WALDEN.