

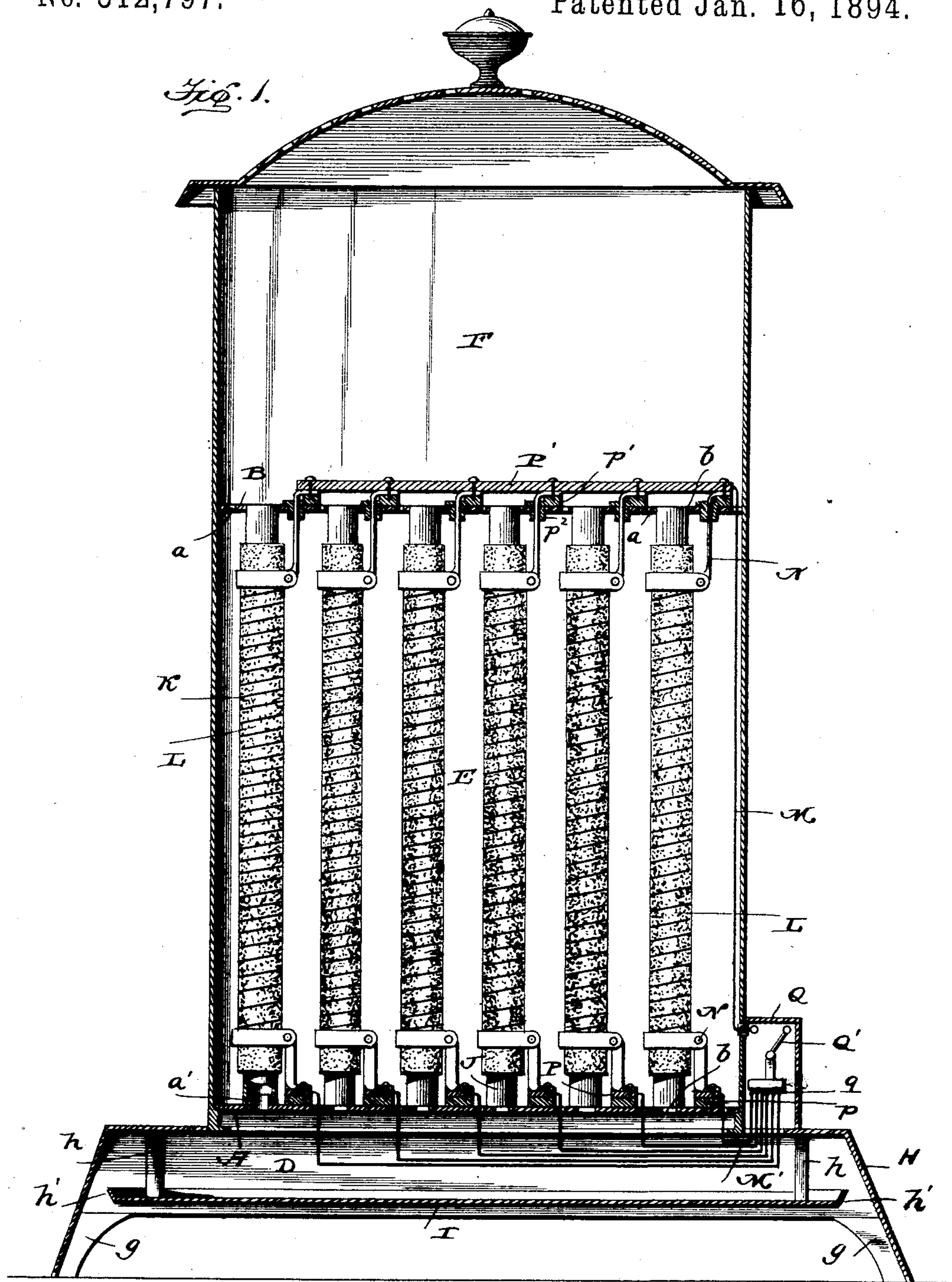
(No Model.)

2 Sheets—Sheet 1.

W. J. BOWEN.  
ELECTRIC HEATER.

No. 512,797.

Patented Jan. 16, 1894.



Witnesses  
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# UNITED STATES PATENT OFFICE.

WILLIAM J. BOWEN, OF NORWALK, OHIO.

## ELECTRIC HEATER.

SPECIFICATION forming part of Letters Patent No. 512,797, dated January 16, 1894.

Application filed April 14, 1893. Serial No. 470,341. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM J. BOWEN, a citizen of the United States, residing at Norwalk, in the county of Huron and State of Ohio, have invented certain new and useful Improvements in Electric 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.

My present invention relates to an improved electric heater which combines air-tubes and chambers with novel arrangement of heating coils through which is passed a current of electrical energy of sufficient volume to heat the tubes and the chamber in which said tubes and coils are contained, whereby cold air is drawn in at the bottom of the heater, caused to pass through the air-tubes and the central warming chamber, and to emerge, in a heated condition, from the top of the heater for warming a room, apartment, a railway car, or for heating purposes generally.

In the preferred embodiment of my invention, I employ two horizontal perforated partitions spaced apart relatively to each other and inclosed within a suitable casing having air inlets at its bottom and air outlets at its top, thus dividing the casing into three compartments, combined with a series of vertical air-tubes which are supported by and between the two partitions and pass through the latter between air-perforations therein, a heating coil wrapped around each air-tube, an insulator covering interposed between the air-tube and its heating coil to prevent the air-tube from being too highly heated from said coil, and suitable conductors connected with the heating coils to energize the latter from a suitable source of electric energy. These heating coils may be connected in series with the working circuit, but I prefer to connect said heating coils in multiple arc with the conductors that lead to said heating coils, in which case each heating coil has a metallic ribbon clamp fastened around each end of said coil on the tube, and each ribbon clamp passes to an insulator bushing fastened to the partitions of the heater, the conductors being attached to connectors placed on said insu-

lated bushings and having the ribbon clamps electrically connected thereto.

Having thus stated the general nature and objects of my invention, I will now proceed to a detailed description of the preferred embodiment thereof, reference being had to the accompanying drawings forming a part of this specification and in which—

Figure 1 is a vertical sectional view through a heater embodying my invention. Figs. 2 and 3 are, respectively, a top plan and longitudinal section through a modified form of my heater especially adapted for a car-heater. Fig. 4 is an enlarged detail sectional view through one of the air-tubes, the heating coil, and parts associated therewith.

Like letters of reference denote corresponding parts in all the figures of the drawings.

A, B, designate the horizontal, perforated partitions which are spaced apart for a suitable distance to provide a chamber between them, and C is the inclosing case or shell within which the partitions are secured or fastened in any desirable manner. These partitions divide the shell or casing C into three compartments or chambers, D, E, F, the middle chamber E being the heating or warming chamber in which are contained the air tubes and heating coils presently referred to, while the lower chamber D is the cold air inlet chamber, and the upper chamber F is the distributing chamber through which the heated air passes from the air tubes and the central chamber E. In the embodiment of my invention shown by Fig. 1, which is especially designed for general warming purposes, the shell G is constructed of cylindrical, square or other desired form, preferably of sheet metal, and fastened to a cast metal base H. This base H is provided with the depending feet *g*, to elevate the base and heater sufficiently for cold air to pass beneath the base, and to insure the necessary draft through the heater, this base is provided with the baffle-plate or diaphragm I. This diaphragm is smaller than the base, and it is fastened to lugs *h* thereon in a manner to leave a surrounding air space *h'* between the base and the baffle-plate to permit the cold air to pass into the chamber D in the manner indicated by the arrows in



Fig. 1. The shell of the heater is provided with a perforated top, through which currents of heated air are free to pass from the upper chamber E, and said top may be surmounted

5 by an urn or other ornament.

In the embodiment of my invention shown by Figs. 2 and 3, which is especially adapted for warming a railway car, the heater is constructed with an elongated compact casing  
10 which can be arranged close on one side of a car to take up very little room therein. This form of the heater has the essential characteristics of the heater shown by Fig. 1, that is it has the casing G provided with the air  
15 inlet perforations  $h'$  near its bottom and the air outlets at its top, and the two perforated partitions A, B, so fastened and arranged therein as to provide the lower, central, and upper chambers, D, E, F. If desired, the cas-  
20 ing may be provided with an air-inlet opening or openings,  $i$ , to the central chamber E, to permit air to pass directly into the heating chamber E, as shown by Fig. 2.

The partitions, A, B, of the heater are each  
25 provided with two series of perforations or openings,  $a$   $b$ , the openings  $a$  being larger than the other openings  $b$ , and said larger openings receive the ends of the air tubes J. These air tubes are arranged in vertical posi-  
30 tions and they are supported by and between the partitions, A, B, in a manner to permit the air in the chamber D to pass up and through the air tubes into the upper chamber F. I prefer to support the lower ends of the verti-  
35 cal air tubes on the lower partition by means of the bosses or flanges  $a'$ , see Fig. 4, while the upper ends of said vertical air tubes pass through the perforations in the upper parti-  
40 tion B, but these vertical tubes can be held in place in any equivalent or suitable manner.

I prefer to employ metallic tubes in the construction of my heater as they can be cheaply manufactured or procured, and to protect the metallic tubes from excessive heating by the  
45 coils K, I cover each tube with a layer or layers of asbestos, or equivalent material, as at L. The wires or conductors K which form the heating coils, are wrapped or coiled around the asbestos jacket L nearly from end to end  
50 of the tube, and a current of electrical energy, in sufficient volume, is caused to traverse these coils to heat the tubes to such a temperature that the air currents traversing the tubes will be made quite hot while at the  
55 same time these exposed heating coils will heat the air in the surrounding chamber E so that a circulation of air is provided through the perforations  $b$  and the chamber E independently of the hot air passing through the  
60 vertical tubes J. These heating coils J may be connected in series with the conductors M, N, but I prefer to connect said coils in multiple arc for the reason that each coil is heated separately and in the event of any one or  
65 more of the coils or tubes being "burned out" or damaged, the circuit is not interrupted or broken, and the damaged coil or its tube can

be removed at leisure to permit of its renewal or replacement by another tube or coil. Each coil has its ends wrapped or coiled quite  
70 closely together for two, three or more turns, as at  $k$ , near the ends of the tube; and upon these close coils,  $k$ , are clamped the ribbon clamps, N, N', each of which has its ends united together as by a set screw or rivet, so  
75 as to bear or press firmly upon the close turns  $k$  and make the necessary good contact with the heating coils and also prevent "burning out" at these terminals of the heating coils. The ribbon clamps are extended at one end  
80 to afford a good connection with the connectors P, P', to which the conductors M, M', are connected as presently described.

The ribbon clamps N at the lower terminals of the heating coils are fastened to inde-  
85 pendent connectors P, one of which is provided for each clamp N and its heating coil; and from the series of connectors P lead a corresponding series of conductors M' which are fastened independently to a series of con-  
90 tacts  $q$ ,  $q$ , in the switch box Q on one side of the heater as shown by Fig. 1. The connectors P are mounted or fitted on insulator blocks  $p$ , preferably of porcelain or any desired material, which are fastened to the partition A  
95 and serve to insulate the connectors P, the conductors M', the clamps and the heating coils from electrical contact with said lower partition A.

On the upper partition B of the heater is  
100 fastened another series of porcelain or other insulating blocks  $p'$ , provided with a series of bushings or eyes  $p^2$  which are seated in or passed through said partitions B. Through these bushings or eyes  $p^2$  are carried the ends  
105 of the upper clamps N', and these clamps are electrically connected to the connector P' common to all of the clamps N'. This connector P' is fastened down upon the series of porcelain blocks  $p'$  by screws or equivalent  
110 fastenings, the conductor M being also fastened to said common connector P'. These conductors M, M', lead from the connectors P, P', to the switch box Q, which contains a switch Q' adapted to make contact with the  
115 terminals  $q$ ,  $q'$ , for cutting one or more of the coils K out of the circuit, so that the capacity of the heater can be controlled or regulated.

This being the construction of my electrical heater, the operation may be described as  
120 follows: The switch in the switch box Q is turned so that the current of electrical energy is allowed to pass through the conductor M, the connectors P, traverse the heating coils, pass to the common connector P', and the con-  
125 ductors M' back to the circuit-conductors. The heating coils are thus energized and serve to heat the air in the chamber E, and also make the air tubes J quite hot. Cold air is admitted to the bottom chamber D, and passes  
130 through the air tubes and through the small perforations in the lower partition A, into and through the chamber E, and out through the small perforations in the upper partition B,



so that a large volume of air is heated during its passage through the tubes and air chamber E and before being discharged into the upper chamber F, and from thence into the room or apartment, it being found that the air passing through the hot tubes J is heated more than the air passing through the chamber E.

I am aware that changes in the form and proportion of parts and details of construction of the devices herein shown and described as an embodiment of my invention can be made without departing from the spirit or sacrificing the advantages thereof, and I therefore reserve the right to make such changes and alterations as fairly fall within the scope of the same.

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

1. In an electric heater, the combination with a casing and the partitions therein, of the series of vertical air-tubes supported between said partitions and each provided with an insulating jacket, the heating coil around said jacket of each tube and having its terminals confined by the clamps, the insulator blocks, and the connectors supported by said blocks and having the clamps and the conductors fastened electrically thereto, substantially as and for the purposes described.

2. In an electric heater, the combination with a casing and the perforated partitions therein, of the air-tubes supported by and between said partitions and each provided

with an insulating jacket, the heating coils around the jacket of each tube and having the close turns,  $k$ , at the ends thereof, the insulator-block having the connector thereon, the clamps N fastened to said connector and to the terminal turns  $k$  at one end of the heating coils, the insulator block P' having the bushing or eyes seated in one of the partitions, the connector on said block P', and the clamps fastened to the other terminal turns,  $k$ , of the heating coils, extended through said eyes or bushings, and fastened to the connector on the block P', substantially as and for the purpose described.

3. In an electric heater, the combination with a casing and the perforated partitions therein, of the air tube between said partitions and each having the insulating jacket, a heating coil wound on the jacket of each tube and provided with clamps at its terminals, a switch box, a series of connectors in electrical connection with one terminal of the heating coils and having independent connections with said switch box, another connector common to the other terminals of the heating coils and connected to the switch-box, and a switch, substantially as and for the purpose described.

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

WILLIAM J. BOWEN.

Witnesses:

E. G. BOUGHTON,  
LENA M. BOUGHTON.