

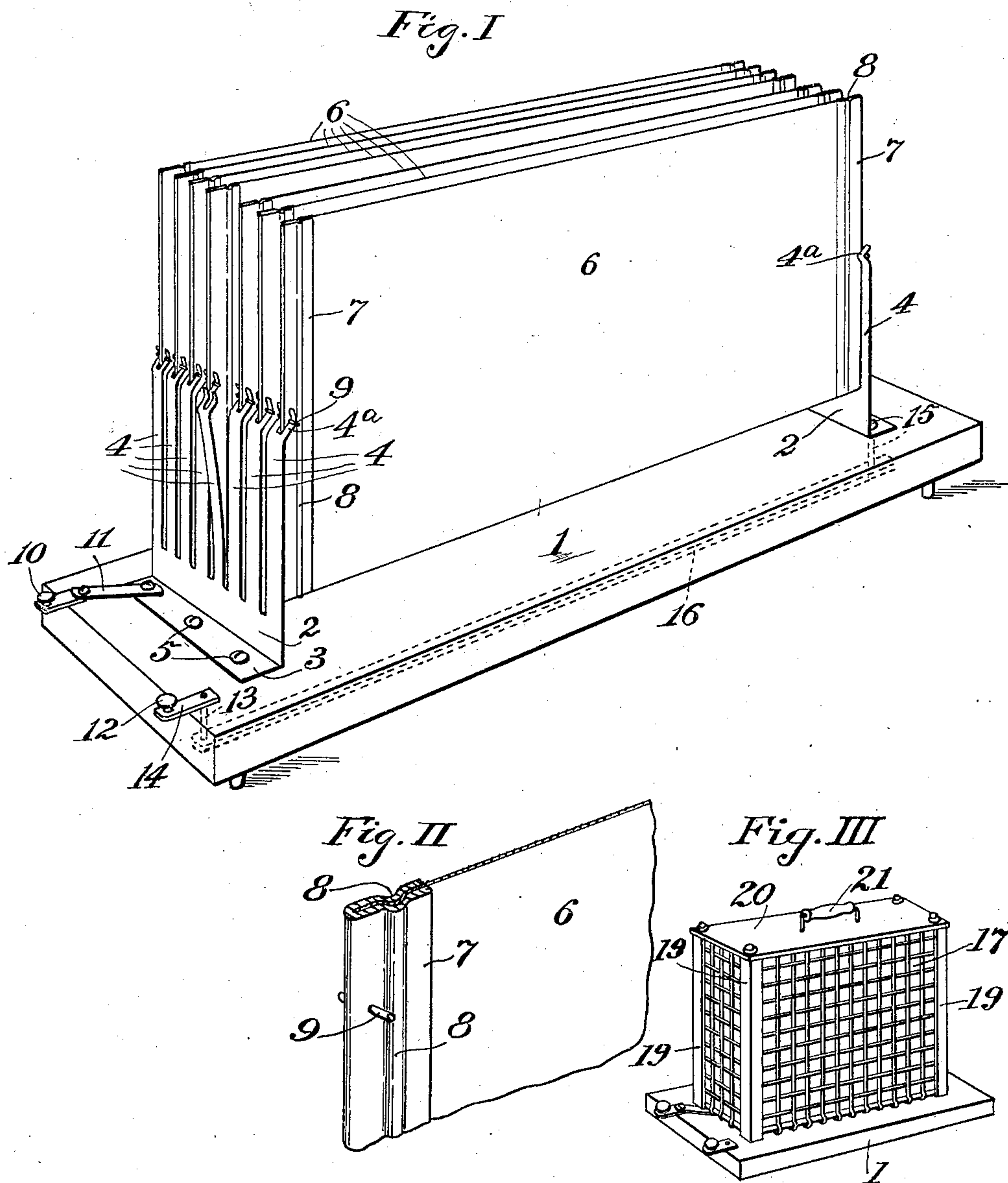
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G. I. LEONARD.
ELECTRIC HEATER.

APPLICATION FILED JAN. 22, 1903.

NO MODEL.



Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE I. LEONARD, OF PASADENA, CALIFORNIA.

ELECTRIC HEATER.

SPECIFICATION forming part of Letters Patent No. 760,076, dated May 17, 1904.

Application filed January 22, 1903. Serial No. 140,176. (No model.)

To all whom it may concern:

Be it known that I, GEORGE I. LEONARD, a citizen of the United States, residing at Pasadena, in the county of Los Angeles and State of California, have invented a new and useful Electric Heater, of which the following is a specification.

Briefly, my invention consists of a base and removable or detachable resistance - plates which are electrically connected and supported by suitable means attached to the base.

One object of my invention is to provide simple, economical, and efficient means for supporting the removable plates in such a way that they may readily be removed, each plate being removable independently without disturbing the others.

Another object of my invention is to provide means whereby each plate is held under a certain amount of tension, thereby preventing the plates from bending, wrinkling, or from rattling or otherwise becoming displaced.

Another object of my invention is to construct the means which support the plates or sheets of resistance material of single pieces, so that each supporting means may be readily attached to the base by two or three screws, so that there is no chance for relative displacement of the resistance-sheets. This also reduces the time and expense required in construction.

Another object is to provide means for reinforcing and stiffening the edges of the sheets of resistance material.

Other objects of my invention reside in improved construction of various parts forming the heater, as will be hereinafter set forth.

Referring to the drawings, Figure I is a perspective view showing my improved heater, one of the resistance-sheets being removed and the cover removed. Fig. II is a perspective view, partially in section, of a portion of the end of a resistance-sheet and illustrates the manner of securing the reinforcing-strips to the edges of the resistance-sheets. Fig. III is a perspective view of the heater complete.

1 designates the base, which may be of any suitable non-conducting material.

2 designates combs, which are arranged op-

posite each other near each end of the base 1. Each comb 2 preferably consists of a single piece of sheet metal comprising an angular lower body 3 and an upper part consisting of vertical parallel teeth in the form of spring-fingers 4. Each spring-finger 4 at its upper end is bifurcated and formed as an angular hook-shaped offset 4^a. The lower portion of the comb 2 is suitably perforated for attaching-screws 5, by means of which it may be secured to the base 1.

6 designates thin plates or sheets formed of a resistance material. The precise material of which these sheets are constructed is not arbitrary, although a fireproof paper coated with graphite would make a cheap and efficient material.

The sheets 6 are preferably rectangular and the end edges are provided with reinforcing-strips of metal 7. Each strip 7 is folded over the edges of the sheet and beaded, as at 8, thus positively clamping the reinforcing - strips over the end of the resistance-sheet and causing the reinforcing-strips to tightly and permanently grip the ends of the resistance-sheets. The strips 7 serve to strengthen the edges of the sheets and also stiffen the same and prevent the sheets from bending and serve to hold the sheets flat. Each strip 7 may be provided with a pin 9, which extends, preferably, an equal distance from each face of the strip 7.

Each sheet 6 is held in position, with its pins 9 resting in the angles of the bifurcated hooks 4^a. The natural spring of the fingers 4 stretches the sheet 6 and places the same under a tension, holding the sheet flat and smooth. By reason of the hook 4^a straddling the strip 7 the sheet is held from side play and also from tilting or rocking motion. The upper and lower portions forming the hook being placed obliquely with respect to the strip 7 thereby give a sufficient amount of bearing-surface for effectually preventing the aforesaid lateral or tilting motion of the strips 7.

When it is desired to remove a sheet 6, it may be readily accomplished by slightly springing in the fingers 4, whereupon the hooks disengage the pins 9 and allow the removal of the sheet 6. The insertion of a sheet

is obviously accomplished with equal facility. The strips 7, pins 9, and combs 2 being constructed of conducting material provide for the introduction of the electric current to the resistance-sheets.

10 designates a suitable terminal which is connected with one comb 2 by means of a strip 11. 12 designates another terminal which is connected with a post 13 by means of a strip 14. 15 designates a post on the opposite comb 2, which may be connected with the post 13 by means of a connection-strip 16, the connection-strip 16 preferably lying along the under side of the base 1.

15 The sheets 6 are supported in vertical parallel planes and spaced a short distance apart. Therefore a circulation of air is secured between the sheets. The sheets are arranged with their lower edges considerably above the base, which permits of the air freely entering under the sheets from either side, which is a very important feature, as volumes of unheated air continually circulate into contact with all of the plates simultaneously—that is, 25 practically the entire surface of each plate is continuously receiving a maximum quantity of unheated air, which is warmed in its passage up the sides of the plate, thus promoting the efficiency of the heater. If the plates 30 rested upon the base, air could only enter at the ends of the plates, and that air which reached the middle portions of the plates would already be warmed and would not keep down the temperature of the middle part of the plate to that of its ends, and the result 35 would be that the plates would heat unevenly and that the air would not be uniformly heated. By my construction a maximum volume of air is heated thoroughly and uniformly. 40 Moreover, the plates are of thin sheets and arranged with free spaces of considerable extent between sheets, so that practically no resistance is offered to the passage of air, and there being no material around or between 45 the sheets to absorb heat the air takes up all of the heat liberated from the sheets and radiation is promoted to the utmost. It is also important that the sheets be arranged vertically to allow for the free upward passage of 50 air being heated. If the sheets were arranged horizontally or inclined, the resistance to the passage of air would retard the circulation and decrease the rate of radiation of heated air from the heater, and the sheets would become 55 excessively heated and deteriorate or even burn out. As it is, the heat produced is at once absorbed by the large volume of air, so that the temperature of the sheets is kept down and maximum efficiency of the heater secured. The air enters around the 60 lower edges of the sheets and passing up between the sheets is warmed and radiated off from the top. Radiation also occurs from the two outside sheets and from the ends of 65 all the sheets into the surrounding air.

17 designates a cover for the heater composed of wire-netting stretched around four corner-posts 18. (Shown in dotted lines.) 19 designates corner-strips for trimming the corners of the cover and acts as struts between the base 70 1 and top 20. The top 20 may be of sheet metal and act as a deflector of the heat. A suitable handle 21 may be attached to the top 20.

Having described my invention, what I 75 claim, and desire to secure by Letters Patent of the United States, is—

1. An electric heater comprising a base, and a vertical, removable, thin resistance-plate, supported with its lower edge above the base. 80

2. An electric heater comprising a base, and a plurality of vertical, removable, thin resistance-plates supported with their lower edges above the base.

3. An electric heater comprising a base, and a series of vertical resistance-plates arranged with provision for admitting unheated air from under the lower edges of the plates. 85

4. An electric heater comprising a base and a series of vertical resistance-plates detachably connected thereto and arranged for the admission of unheated air from under the lower edges of the plates. 90

5. An electric heater comprising a base and a plurality of thin, vertical, detachable, resistance-plates arranged in parallel planes with their lower edge above the base. 95

6. An electric heater comprising a base, a resistance-plate, and means carried by the base for supporting and yieldingly locking said 100 plates.

7. An electric heater comprising a base, a sheet of resistance material, and means for automatically supporting and yieldingly locking said sheet under tension. 105

8. An electric heater comprising a base, a plurality of sheets of resistance material, and means for supporting and independently locking the respective sheets.

9. An electric heater comprising a base, a sheet of resistance material, and reinforcing means permanently attached to edges of the sheet. 110

10. An electric heater comprising a base, a sheet of resistance material, and reinforcing means permanently attached to opposite edges of the sheet. 115

11. An electric heater comprising a base, a sheet of resistance material, and reinforcing means comprising conducting material permanently attached to edges of the sheet. 120

12. An electric heater comprising a base, a sheet of resistance material, and means for reinforcing the edge of the sheet comprising a metallic piece folded over the edge of the sheet and beaded. 125

13. An electric heater comprising a base, a sheet of resistance material, and a metallic piece folded over and beaded on opposite parallel edges of the sheet. 130

14. An electric heater comprising a base, and a plurality of independent thin sheets of resistance material occupying parallel planes, the lower edge of each sheet being arranged
5 considerably above the base.

15. An electric heater comprising a base, and a plurality of independent detachable thin sheets of resistance material occupying vertical planes, the lower edge of each sheet
10 being arranged considerably above the base.

16. An electric heater comprising a base, a sheet of resistance material, means for detachably holding and supporting one edge of said sheet and means for detachably holding
15 and supporting another edge of said sheet for placing the sheet under tension embracing a spring-finger mounted on the base, and connected to the sheet.

17. An electric heater comprising a base, a
20 sheet of resistance material, and spring-fingers mounted on the base, connected to the sheets and supporting opposite ends of the sheet.

18. An electric heater comprising a base, a plurality of independent detachable sheets of
25 resistance material, and a plurality of spring-fingers mounted on the base, connected to the sheets and supporting the sheets.

19. An electric heater comprising a base, a plurality of independent resistance-plates, a
30 plurality of spring-fingers mounted on the base, pins on the ends of the sheets, said pins engaging the spring-fingers.

20. An electric heater comprising a base, spring-fingers connected with the base, the

free ends of the fingers being hooked, and 35 pins on the ends of the sheets engaging the hooked ends of the fingers.

21. An electric heater comprising a base, a pair of combs mounted on the base, spring-
40 fingers forming the teeth of the combs, the upper ends of the spring-fingers being bifurcated hook-shaped offsets, sheets of resistance material, and means near the ends of the sheets and coacting with the hooked
45 ends of the fingers for supporting the sheets, the edges of the sheets lying within the bifurcated hooked portions.

22. An electric heater comprising a base, a pair of combs mounted on the base, spring-
50 fingers forming the teeth of the combs, the upper ends of the spring-fingers being bifurcated hook-shaped offsets, sheets of resistance material, metallic pieces folded over and beaded on the edges of the sheets, pins through
55 the metal pieces, said pins engaging the hooked offsets of the combs, the metal pieces being straddled by the bifurcated hooked parts, thereby supporting the sheets.

In testimony whereof I have signed my name to this specification, in the presence of two
60 subscribing witnesses, in Los Angeles, in the county of Los Angeles and State of California, this 26th day of December, 1902.

GEORGE I. LEONARD.

Witnesses:

GEORGE T. HACKLEY,
FREDERICK S. LYON.