Aug. 7, 1928. 1,679,841

H. N. SHAW

ELECTRIC CONVECTION HEATER

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Fig. 1.

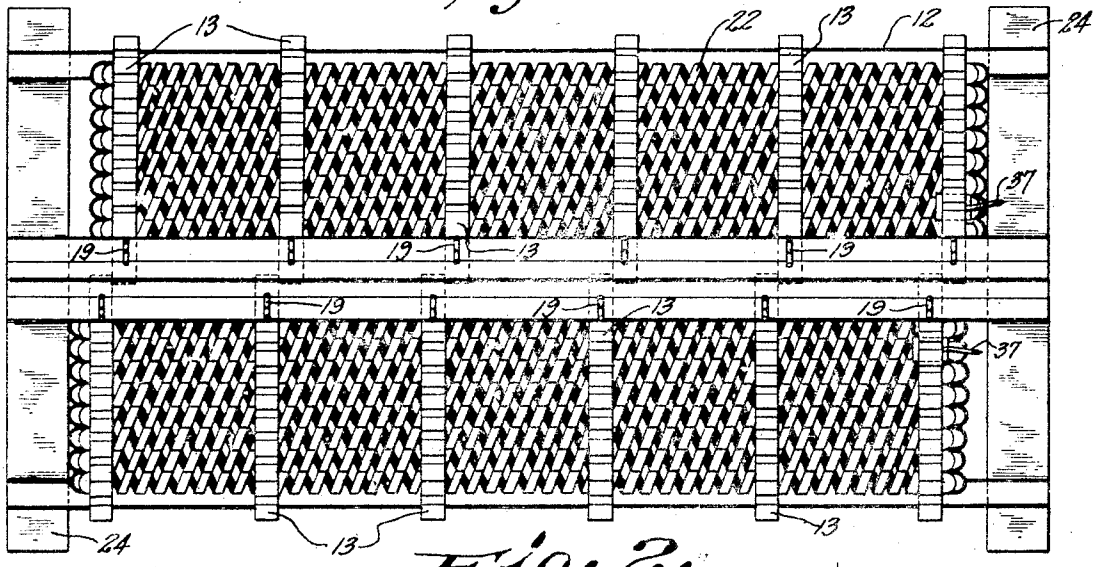


Fig. 2.

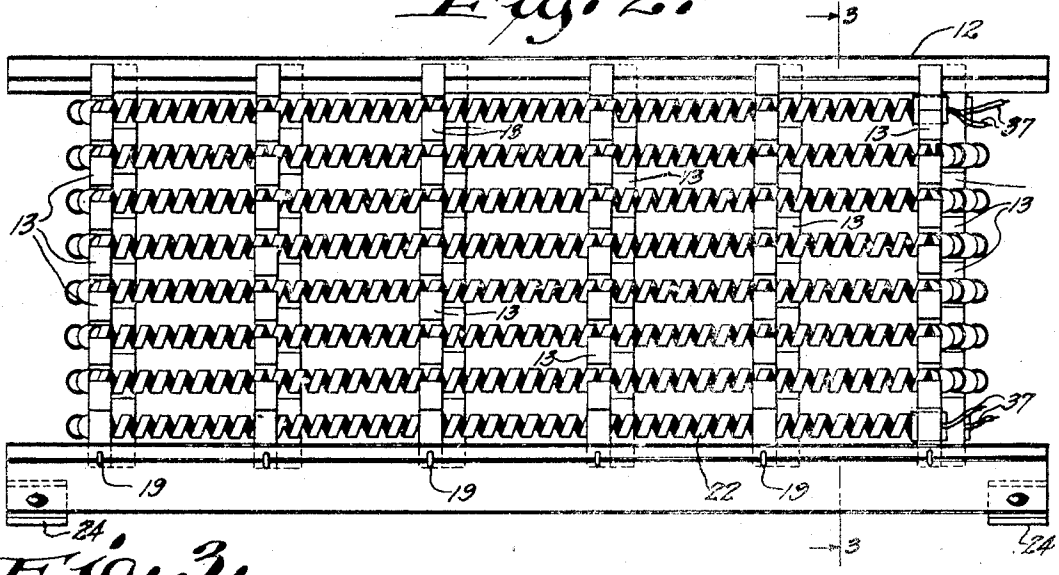
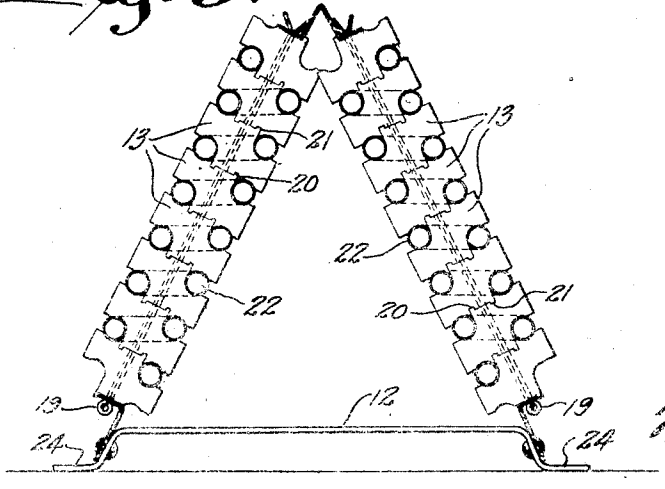


Fig. 3.



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Fig. 4.

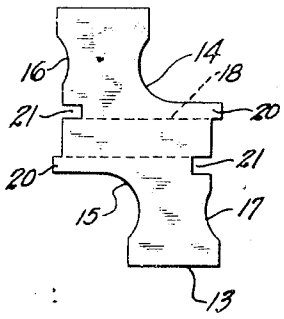


Fig. 5.

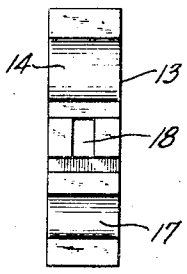


Fig. 6.

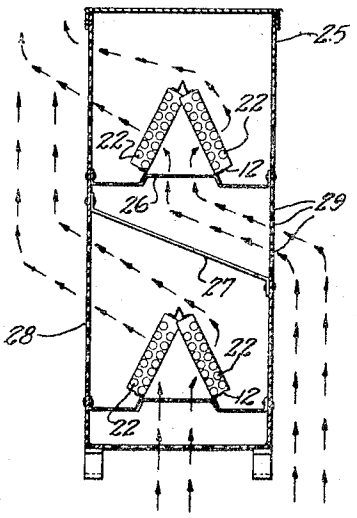


Fig. 7.

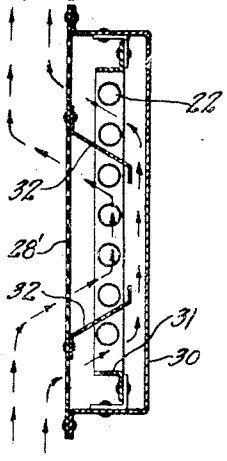


Fig. 8.

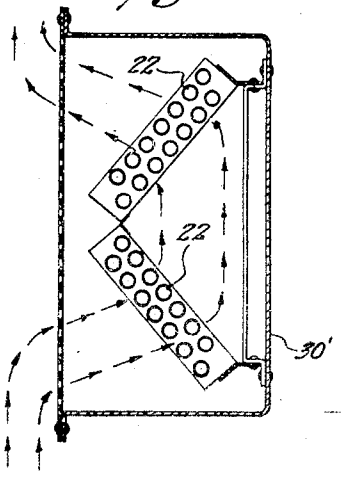


Fig. 9.

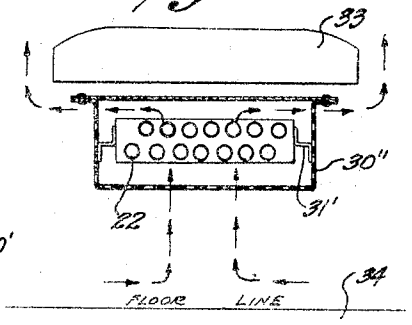


Fig. 10.

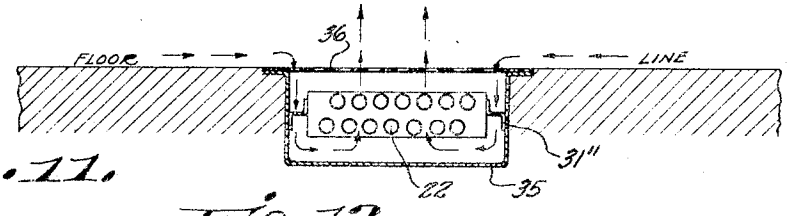


Fig. 11.

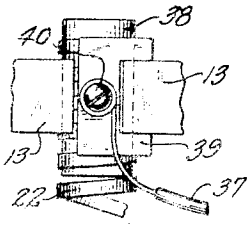
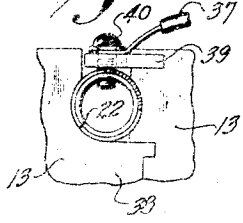


Fig. 12.



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UNITED STATES PATENT OFFICE.

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ELECTRIC CONVECTION HEATER.

Application filed February 7, 1927. Serial No. 166,481.

This invention relates to improvements in electric convection heaters.

Ordinary electric heaters usually use resistance wire for heating units, and, because of the small diameter of the wire which must be heated to a high temperature for localized heat, it has not been practical to use units of this character for heating large areas. Also, the ordinary resistance wire is heated to an incandescent state and there is always the possibility of inflammable material coming in contact therewith and becoming ignited.

It is one of the primary objects of the present invention to overcome the before mentioned objections by providing an electric convection heater in which the resistance element is formed of a material of comparatively large surface area to transmit a larger amount of heat at a lower temperature than is common with ordinary resistance elements, this low temperature also permitting the use of a shiny element surface.

A further object of the invention is to provide a convection heater in which the resistance unit is formed of a thin strip or ribbon of coiled metal supported in a frame to provide efficient heat by convection, said ribbon to have a shiny surface so as to reduce radiation to a minimum.

A further object of the invention is to provide an electric convection heater designed to produce a small temperature rise in a large volume of air, thereby preserving a low temperature difference between the top and floor of a room or chamber being heated.

A further object of the invention is to provide an electric convection heater for air which has a relatively large heating area, but is simply and ruggedly constructed and is inexpensive to manufacture.

A further object of the invention is to provide an electric heating element adapted to operate at a temperature near that of the air in the chamber being heated, which therefore changes in temperature as the chamber temperature changes, making possible the control of the chamber temperature by the use of a heating element having a suitable temperature coefficient of resistance and in series with which a suitable magnetic control switch may be used.

A further object of the invention is to provide an electric convection heater arranged so that the heating elements present a large area of heating surface with respect to the air path and a relatively short path of travel for the air through the heating elements.

A further object of the invention is to provide an electric convection heater which is of very simple construction, is strong and durable, is efficient in operation, and is well adapted for the purposes described.

With the above and other objects in view the invention consists of the improved electric convection heater and its parts and combinations as set forth in the claims and all equivalents thereof.

In the accompanying drawing in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a plan view of the improved electric convection heater;

Fig. 2 is a side view thereof;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged detail side view of one of the insulator brackets used in the heater;

Fig. 5 is an edge view thereof;

Fig. 6 is a sectional view of a casing showing the arrangement of several heating units therein;

Fig. 7 is a sectional view illustrating as a modification, a shallow type casing and heating units therein for wall or oven use;

Fig. 8 is a sectional view of another modified type of heater for wall use;

Fig. 9 is a sectional view of a casing and heating units therein disposed below a vehicle seat;

Fig. 10 is an illustration of a type of heater adapted to be positioned below a floor line; and

Figs. 11 and 12 are enlarged fragmentary detail views showing the connector means employed between the circuit wires and the ends of the resistance elements.

Referring now more particularly to the drawings it will appear that the numeral 12 indicates a frame of triangular shape in cross-section. Each inclined face of the frame is provided with rows of insulator brackets 13. One of said brackets 13 is shown in detail in Figs. 4 and 5 and it will be seen that it is formed with opposed curved recesses 14 and 15 and complementary recesses 16 and 17 of a lesser curvature. Each bracket has a medial transverse opening 18 and a row of brackets are secured together and to the frame by means of a pin

19 extended through the registering openings 18, as shown in Fig. 3. When thus assembled, cooperating tongues 20 and recesses 21 also assist in securing the brackets together and preventing electrical leakage.

The rows of bracket members 13 on each face of the frame are adapted to receive and support an elongated resistance element 22. Said resistance element is formed of a strip of thin resistance metal having a shiny surface and of comparatively considerable width with reference to resistance wire used in standard practice and is wound spirally and of a diameter comparatively large throughout its length, as clearly shown in the drawing.

As shown clearly in Figs. 2 and 3 each resistance element is extended through a horizontal row of rear recesses in a horizontal row of brackets 13 and longitudinally of the side of the frame. At the end of the frame the element is bent around and extended longitudinally through the next adjacent horizontal row of recesses in said brackets, and so on.

The free ends of each resistance element are attached to circuit wires 37 by means of connectors shown in detail in Figs 11 and 12. Each connector comprises a short section of brass pipe 38 extending into the end portion of the resistance element 22 and inserted through the recesses in the insulator brackets thereadjacent. A U-shaped locking bracket 39 is then lodged in the recess over the pipe and the end portions of the bracket 39 engage the sides of the insulator bracket. A screw 40 is extended through the locking bracket and into the pipe and the end portion of the circuit wire 37 is also engaged and clamped by said screw.

It will thus be seen that a heater arranged as described presents a large heating area at right angles to the path of the air being heated and the path of the air through the heating elements is comparatively short. In practice, the resistance elements are not heated to a temperature high enough to tend toward discoloration.

The type of frame shown in Figs. 1, 2, and 3 is provided with supporting legs or feet 24.

Fig. 6 illustrates the use of several heaters in a casing 25 when a greater amount of heat is required for a chamber. A heater 12 formed of a pair of angularly disposed frames having insulator brackets and resistance elements mounted as previously described, is positioned on a support 26 in the upper portion of the casing and a similar heater 12 is also supported by a member 26′ in the lower portion of the casing, the two heaters being separated by an inclined deflector plate 27. The front of the casing, indicated at 28, is formed of screen, as is also the bottom, while the rear of the casing has perforations 29. The arrows show the course of the cold air into the casing and also the exit of the heated air after it has passed over the heating elements.

In Fig. 7 a casing and heater therein for mounting in a wall recess is illustrated. The casing 30 is of a shallow type and the resistance element 22 is mounted therein on insulator brackets carried by a frame 31. The front of the casing is covered by a screen 28′ or other perforate material and the cold air enters the lower portion thereof, circulating as indicated by the arrows, and around deflector plates 32.

A deep type wall casing 30′ is shown in Fig. 8 and a frame of triangular formation to support the heating elements 22 is mounted therein. This type of heater presents a larger heating area than that shown in Fig. 7.

The convection heater may also be used for heating vehicles and other small seated compartments, and as shown in Fig. 9 a casing 30″, having perforate bottom and side walls, is mounted below a seat 33 and above the floor line 34. A frame 31′, carrying the resistance element, is of course, disposed within the casing.

Fig. 10 illustrates a heater disposed below the floor line of a room or chamber. The floor is recessed to receive the casing 35 which has a perforate top covering 36 and which contains the resistance element 22 and supporting frame 31″. The air enters the casing through the end portions of the perforate top, passes over the resistance element, and then rises through the medial portion of the top.

From the foregoing description it will be seen that the improved electric convection heater is of very simple and novel construction, and is well adapted for the purposes set forth.

What I claim as my invention is:

1. An electric convection heater, comprising a triangular frame, insulating supports carried by opposite side inclined faces of the frame, and a spiral resistance element mounted on the supports on each side face of the frame and extending back and forth on said supports longitudinally of the frame, said resistance elements being modified from standard practice by a substantial increase in width and a substantial reduction in the thickness of the metal in the element and also in a substantial increase in the diameter of the spiral to provide a comparatively large surface area and permit heating at a comparatively low temperature.

2. An electric convection heater, comprising a frame, a plurality of insulating supports mounted in rows thereon, said supports having opposed recesses and cooperating locking means, a pin extending through the supports in a row and through the

frame, and an elongated spiral resistance element extending back and forth through said support recesses.

3. An electric convection heater, comprising a frame, a plurality of insulating supports mounted in rows thereon, an elongated spiral resistance element extending back and forth through said supports, said resistance elements having a shiny non-radiating surface, circuit wires, and connections between said circuit wires and the free ends of said resistance element, each connection comprising a metal pipe surrounded by an end portion of the resistance element and engaged by a support, a locking bracket overlying the pipe and engaging the support, and a stud extending through the bracket and pipe and engaging the circuit wire and resistance element.

4. An electric convection heater, comprising a frame of triangular shape in cross-section, a plurality of insulating supports mounted in rows on the opposite side inclined faces of the frame, said supports having opposed recesses and cooperating locking means, a pin extending through the supports in a row and through the frame, an elongated spiral shiny resistance element mounted through the recesses of the supports on each side of the frame and extending back and forth longitudinally of the frame, circuit wires, and connectors between said circuit wires and the free ends of the resistance elements, each connector comprising a metal pipe surrounded by the end portion of the resistance element and lodged in a support recess, a locking bracket overlying the pipe and engaging the support, and a stud extending through the bracket and pipe and engaging the circuit wire and resistance element.

5. An electric convection heater, comprising a frame, a plurality of insulating supports mounted in rows thereon, said supports having opposed recesses, a pin extending through the supports in a row and through the frame, and an elongated spiral resistance element extending back and forth through said support recesses.

In testimony whereof, I affix my signature.

HAROLD N. SHAW.