April 21, 1942. W. G. CARTTER ET AL 2,280,061

RADIANT MANTLE

Filed Jan. 29, 1940

Fig. 1.

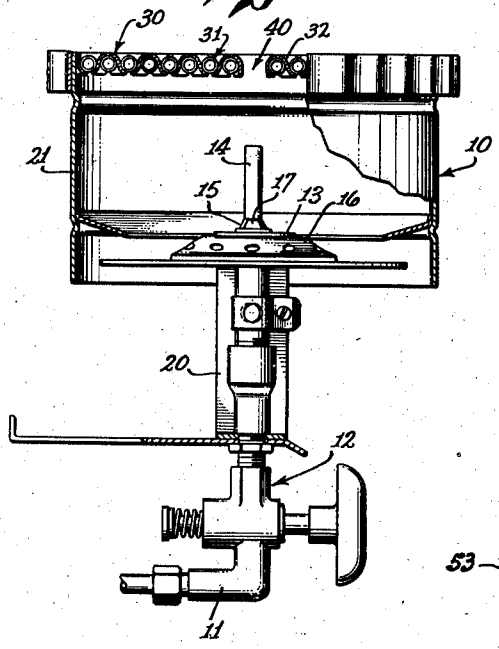
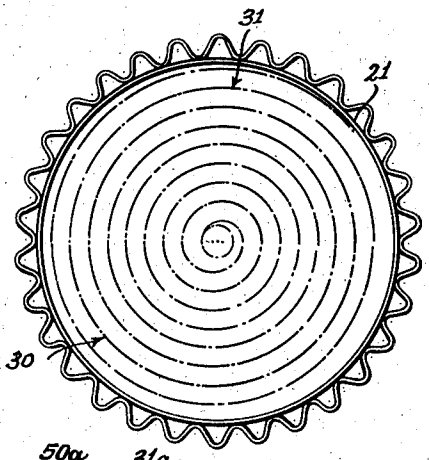


Fig. 2.



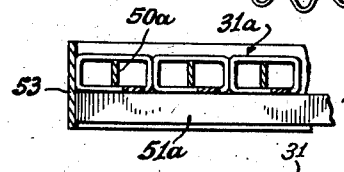


Fig. 7.

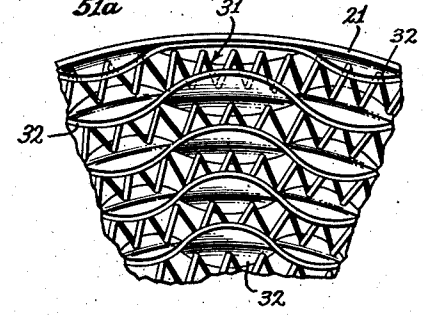


Fig. 3.

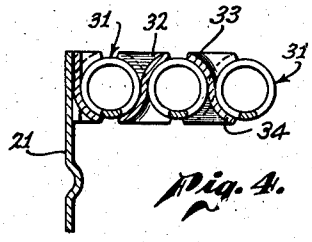


Fig. 4.

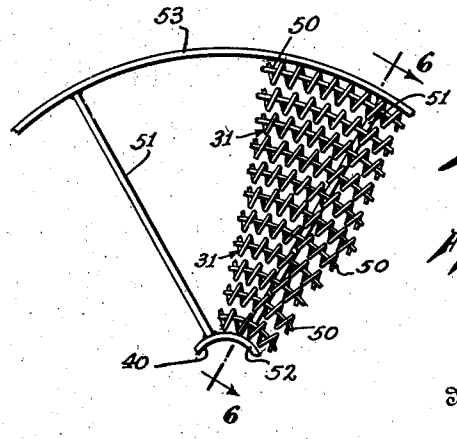


Fig. 5.

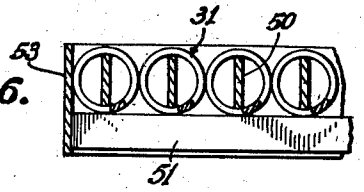


Fig. 6.

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RADIANT MANTLE

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Application January 29, 1940, Serial No. 316,116

7 Claims. (Cl. 158—113)

This invention relates to gas heaters and particularly to a radiant mantle for incorporation in a gas heater. By gas heater we intend to include any type of heater in which the combustion of a fluid generates the heat.

This application is a continuation in part of our co-pending application Serial No. 259,533 filed March 3, 1939.

At the present time space heaters are being provided which utilize gas as a fuel and which incorporate a member interposed between the gas and the space to be heated whereby the interposed member is heated to a point of incandescence.

It is the principal object of the present invention to provide a heater which may be used in connection with stoves or the like for cooking purposes but which is more particularly adapted for heating the air in a given space, such as a room, and which structure is small and compact in design and embodies the use of a burner and a mantle element made of metal which in use is heated to a point of incandescence so that heat is radiated.

It is a further object of our invention to provide a foraminous mantle of the character described in which heated gases may freely pass through and upwardly away from the mantle in aid of combustion in the burner below as well as providing for circulating heat in addition to the radiant heat emanating from the mantle.

It is a further object of the invention to provide means whereby the burner concealed by the mantle may be ignited substantially instantly without the risk that a sufficient amount of gas will accumulate to a danger point before ignition, at which time an explosion might occur.

It is another object of the invention to provide a mantle fabricated from metal, which is cheap in construction cost and may be readily made to conform to any desired configuration.

The present invention is intended especially for use with a burner enclosed within a housing to furnish a combustion chamber, as shown in our co-pending application identified above, the mantle being located at the upper end of the housing, the burner and the mantle being formed with cooperating means whereby the flame from the burner may be directly ignited through the mantle for instantaneous combustion and without impairing the usefulness of the mantle as an incandescent radiant heating element. The mantle has the appearance of an electric resistance grid, although it is heated by the use of gaseous fuel.

The invention is illustrated in the accompanying drawing in which—

Figure 1 is a vertical section through a burner assembly incorporating our mantle.

Figure 2 is a schematic plan view of the burner assembly illustrating the spiral arrangement of the coiled wire used in the mantle.

Figure 3 is an enlarged fragmentary view of the mantle shown in Figures 1 and 2.

Figure 4 is an enlarged fragmentary view of the mantle along the same section line as taken for Figure 1.

Figure 5 is a partial plan view of a modified form of mantle.

Figure 6 is an enlarged fragmentary section of the form of mantle shown in Figure 5 and is taken on line 6—6 of that figure.

Figure 7 is a fragmentary section illustrating a flat coiled wire in place of a circular coil.

Referring more particularly to the drawing, 10 indicates a burner assembly connected by a tube 11 with a suitable source of fuel supply, and including a valve 12, and a burner 13. Above the burner is an ignition tube 14 supported by arms 15, and in line with an orifice, not shown, in the upper face of the portion 16 of the burner. The arms position the inner end of the ignition tube 14 above the end face of the burner, also providing a space 17. The upper end of the tube 14 terminates at a desired position as will be hereinafter set forth. When the gas is turned on for lighting, the orifice will conduct a mixture of gas and air from the burner 13 up into the tube 14, so that a match applied above the upper end of the tube will ignite the gas in the tube. This will burn down and flare out through the feet, igniting the gas issuing from the burner, and thereupon the flame in the orifice and tube will die out.

Supported upon uprights 20 of the burner structure 10 is a housing or drum 21. The drum 21 is mounted concentrically with the axis of the burner and the ignition tube. The upper end of the drum 21 is open and in the preferred form of the invention here shown defines a circular space within which a radiant mantle 30 is positioned. This mantle is of special design and novelty.

By reference to Figures 1, 2 and 3 of the drawing it will be seen that the mantle comprises a continuous wire coiled in the form of a helix, as indicated at 31, the coil being arranged spirally in a single plane as shown schematically in Figure 2. Between the convolutions of the spirally arranged coiled wire 31 a spacing ribbon 32 is

placed. This ribbon is also continuous and acts to hold the element 31 against vertical displacement when the structure is assembled and positioned within the drum 21. As shown in the drawing, the ribbon is fluted along its opposite edges so that the marginal edges of the ribbon have a sinuous appearance. Upper outwardly curved flutes 33 are bent alternately over the upper edges of contiguous convolutions of the coiled wire 31 and oppositely bent flutes 34 extend around the alternate lower sides of the convolutions of the coiled wire 31, as particularly shown in Figure 4 of the drawing.

By this arrangement it will be seen that the convolutions of the radiant element will be securely assembled and will maintain their aligned position within a flat plane at the upper end of the drum 21.

The wire forming the element 31 and the ribbon forming the element 32 may be made of any suitable metal or alloy such for example as chrome steel.

At the vortex of the spiral forming the mantle is a central opening 40. This opening is disposed directly above the upper open end of the ignition tube 14. This is for the purpose of facilitating the lighting of the gas issuing from the upper end of the tube 14. If the pitch of the coiled wire is long so that there is considerable space between successive turns, it is feasible to eliminate the central opening 40 and light the gas as it issues up through the mantle.

The mantle is placed above the burner a sufficient distance so that the mantle is above the normal upper limit of the flame, and so the flame will heat the mantle to incandescence but will not pass through the mantle. The convolutions of the wire in the coil must be slightly spaced apart as otherwise the mantle would have the effect of a solid plate. This spacing should be wide enough for the heat at the upper limits of the burner flame to readily penetrate. Any combustion which may occur at this point will not be visible to the eye, and when the mantle has become properly heated, the incandescent glow will dominate the burner flame and the latter will not be normally visible.

When the mantle as described is employed in a room heater, the metal ribbon 32 is adequate to support the coiled wire 31, as there is no external weight on the mantle. We preferably construct the mantle as a unit separate from the burner structure, for installation therein, the outermost convolution of the ribbon 32 serving as a confining band, which may be turned in at the end and welded to the next inner winding of the metal ribbon. A separate confining band 53, as employed in the other forms, subsequently described, may be used with this preferred form if desired.

In the operation of the invention the burner structure is assembled as shown in the drawing and is connected to a suitable source of fuel. This fuel is preferably a gaseous fuel, which when delivered to the burner will produce a combustible gas. Igniting means is placed at a point above the surface of the mantle and will temporarily ignite gas passing therethrough, after which the flame will ignite the gas in the end of the tube 14 and then ignite the burner. When the burner is in full operation, the combustion takes place within the drum 21 and the mantle 30 will be heated to the point of incandescence.

It will thus be seen that the structure described provides simple and effective means for heating air by radiation without sacrificing circulation, and by the use of a gaseous fuel, and that furthermore, it provides a heating element which will maintain its shape when heated, will not sag, and through which ignition may be brought about without danger of explosion.

The mantle may be made oval in plan instead of circular, if desired, without changing the elements of which it is comprised.

In the modified form shown in Figures 5 and 6 the coiled wire is arranged in a spiral preferably with the convolutions immediately adjacent. Before the coil is so arranged a metallic strip 50 is vertically positioned in the coil. The strip is preferably of height equal to the inside diameter of the coil so as to extend diametrically and vertically across the same, although it is sufficient for the upper part of the coil to rest upon the upper edge of the metallic strip. This strip should be relatively thin so as not to materially obstruct the rising of heated gases but should be rigid enough to hold the spiral in a plane as illustrated in Figure 6 or any other form desired such, for instance, as pyramidal with the center raised or conical with the center dropped.

Additional support may be provided for this or any other form of mantles illustrated, by a radial spider 51, the outer ends of which are welded or otherwise attached to a circumferential confining band 53. This spider may be made with a central collar 52 affording an opening through which to light the burner as well as a barrier against which the inner convolution of the spiral rests. The central collar is not a necessary element in any of the forms, however, as the coil may be welded to the inner ends of the spider arms.

In place of the circular coiled wire illustrated in the other forms of our invention we consider a square or rectangular type of wire coil as illustrated in Figure 7 to be the equivalent. This may be mounted as specifically illustrated in Figure 7, which is the same arrangement as shown in Figure 6, or it is susceptible of being mounted according to any other of the teachings in this specification.

We consider all of the modified forms shown and described, as well as other possible modifications, to be equivalent to the preferred form, considering the latter as the basis for generic claims. Our broad concept is a radiant mantle for gas heaters in which the mantle is to be placed in the burner assembly between the burner itself and the normal heat exit and preferably above the normal upper limit of flame from the burner. The mantle is a coiled wire suitably supported in the form of a spiral or other arrangement in which the coiled wire occupies most of the area covered by the mantle. The pitch of the convolutions in the coil must be sufficiently great to provide ample space through which heated gases may rise in aid of combustion in the burner below, as well as to prevent fusing of the metal. The supporting means must be firm enough to retain the shape of the mantle as formed without presenting any substantial bulk to obstruct the upward flow of the heated gases. It is desirable that the material and proportions of the coiled wire and the supporting elements be such that they heat evenly and maintain comparable incandescence.

What we claim as our invention is:

1. A mantle for radiant heaters comprising a a helically wound coil arranged in spiral shape, and means for holding the coil as thus arranged, said means comprising a ribbon of metal wound

spirally and between which the convolutions of the helically wound member are disposed.

2. A mantle for radiant heaters comprising a helically wound coil arranged in spiral shape while lying in a common plane, means for holding the coil as thus arranged, said means comprising a ribbon of metal wound spirally and between which the convolutions of the helically wound member are disposed, and means carried by said ribbon to engage and hold the helically wound member in position.

3. A mantle for radiant heaters comprising a helically wound coil arranged in spiral shape while lying in a common plane, and means for holding the coil as thus arranged, said means comprising a ribbon of metal wound spirally and between which the convolutions of the helically wound member are disposed, the edges of said ribbon being fluted to embrace contiguous sides of the convolutions of the coiled member disposed therebeneath.

4. A heating element comprising a helically wound length of wire and a strip of metal of substantially the same length as that of the wire, said strip and wire being wound together spirally and lying in a common plane, and a member around the circumference of said structure holding the members in their wound position.

5. A heating element comprising a helically wound length of wire and a strip of metal of substantially the same length as that of the wire, said strip and wire being wound together spirally and lying in a common plane, and a member around the circumference of said structure holding the members in their wound position, the strip of metal being formed along its opposite edges with alternately directed fluted portions, the flutes along the opposite edges extending oppositely in the same transverse vertical planes, whereby the helically wound wire will be partially embraced by the fluted portions to hold the entire structure in a rigid assembled condition.

6. A mantle for radiant heaters comprising a helically coiled wire arranged in spiral shape, and means for holding the coil as thus arranged, said means comprising a ribbon of metal extended longitudinally through the coiled wire.

7. A mantle for radiant heaters comprising a wire coil arranged in spiral shape, and means for holding the coil as thus arranged, said means comprising a ribbon of metal wound spirally and between which the convolutions of the helically wound member are disposed.

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