Nov. 18, 1941. F. E. WOOD ET AL 2,263,432

RADIANT MANTLE

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Fig. 1.

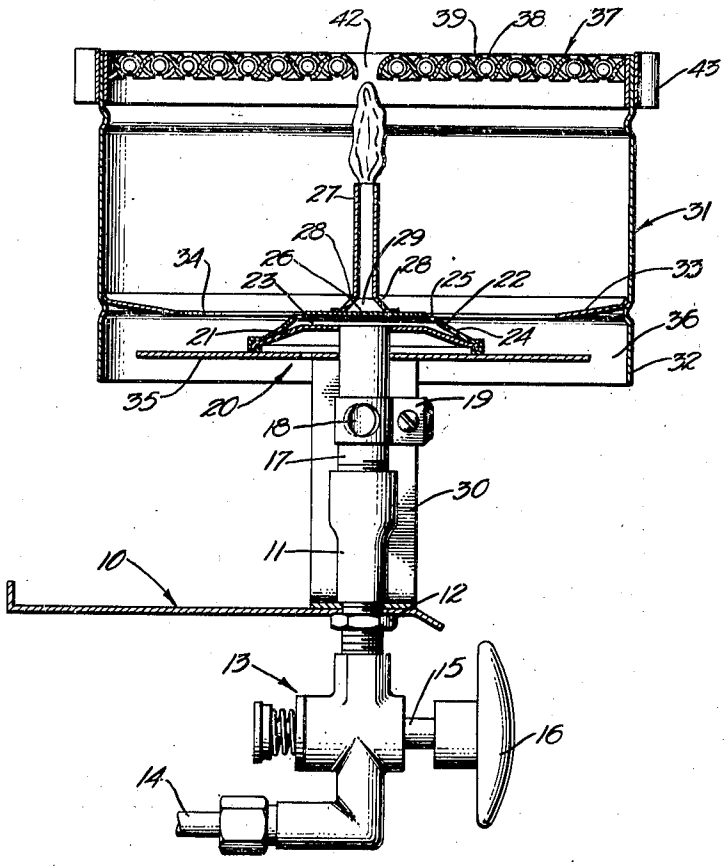

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Fig. 2.

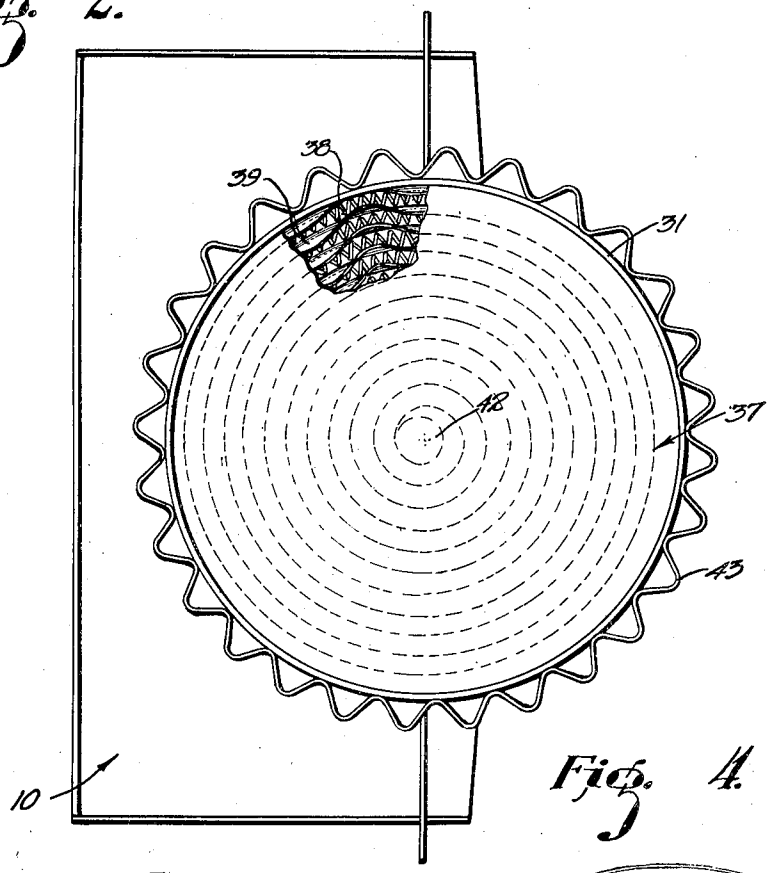


Fig. 4.

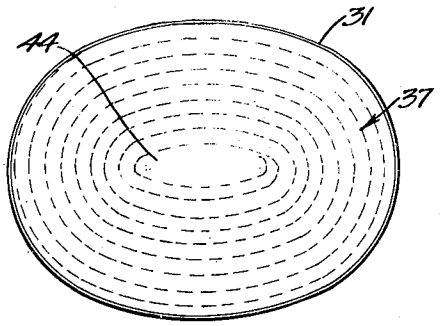
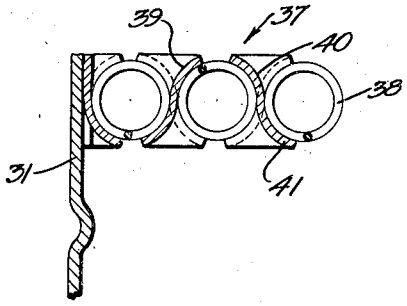


Fig. 3.



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Patented Nov. 18, 1941

2,263,432

UNITED STATES PATENT OFFICE

2,263,432

RADIANT MANTLE

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Application March 3, 1939, Serial No. 259,533

3 Claims. (Cl. 126—85)

This invention relates to heating apparatus and particularly pertains to a radiant mantle.

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 acts as a screen operating on the principle of a Bunsen burner in that the flame produced on one side of the mantle will not pass through the mantle and into the space therebeyond but will act to heat the mantle to a point of incandescence so that the heat may be radiated within the space to be heated, it being a further object of the invention to provide means whereby the burner concealed by the mantle may be ignited substantially instantly without danger that a sufficient amount of gas will accumulate before ignition to a danger point, 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 contemplates the provision of a burner enclosed within a housing to furnish a combustion chamber and the open end of which is covered by a metal mantle, the burner and 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 having the appearance of an electric resistance grid, although it is heated by the use of gaseous fuel.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a view in central vertical section through the structure showing the relation of the parts of the invention.

Fig. 2 is a view in plan showing the heating structure and particularly disclosing the preferred form of mantle.

Fig. 3 is an enlarged view in section through the mantle as seen on the line 3—3 of Fig. 2, showing the formation and assembly of the mantle coil and the spacing ribbon.

Fig. 4 is a view in diagram indicating another form of mantle which is here shown as being substantially oval.

Referring more particularly to the drawings, 10 indicates a frame structure carrying a nipple 11 which is secured in position by a fastening nut 12. Secured to the threaded end of the nipple is a valve structure 13 connected by a tube 14 with a suitable source of fuel supply. The valve stem 15 of the valve structure is provided with a handle 16 by which the valve may be opened and closed. Threaded into the upper end of the nipple 11 is a burner tube 17 having an air regulating opening 18 over which an adjusting sleeve 19 may be set. Carried at the upper end of the tube 17 is a burner 20, here shown as comprising a back plate 21 carrying a front plate 22. Both plates are circular in shape and are convexed in section. A space 23 occurs between the plates and they are united along their outer edges by a suitable sealing flange or bead. A plurality of gas outlet openings 24 and 25 occur in the outermost plate 22 and through which jets of gas may be projected for subsequent ignition. A central opening 26 is formed in the outer plate and over it an ignition tube 27 is supported by arms 28. Attention is directed to the fact that these arms space the inner end of the ignition tube 27 around the end face of the portion 22 of the burner whereby a space 29 will occur. The upper end of the tube 27 terminates at a desired position as will be hereinafter set forth.

Supported upon uprights 30 of the frame structure 10 is a drum 31. The drum 31 is mounted concentrically with the axis of the burner 20 and the ignition tube 27. The drum has a skirt portion 32 which extends downwardly and circumscribes the burner 20. The lower edge of the skirt 32 is below the lower edge of the burner 20, as shown in Fig. 1 of the drawings. Mounted substantially in the transverse plane of the top of the burner 20 is a throat ring 33 having a central opening 34 through which air may pass to support combustion of fuel within the drum. Mounted beneath the burner and within the skirt is a deflector plate 35 through which the burner tube 17 extends. This deflector plate is of a lesser diameter than the inside diameter of the skirt 32 and of a greater diameter than the diameter of the opening 34 through the throat plate 33. Thus, an annular passageway 36 occurs around the edge of the plate 35 and within the skirt 32. The outer end of the drum 31 is open and in the form of the invention here shown defines a circular space within which a radiant mantle 37 is positioned. This mantle is of special design and novelty.

By reference to Fig. 2 of the drawings it will be seen that the mantle comprises a continuous wire wound in the form of a helix, as indicated at 38, and then arranged spirally in a single plane. Between the convolutions of the spirally arranged element 38 a spacing ribbon 39 occurs,

This ribbon is also continuous and acts to hold the element **38** against lateral displacement when the structure is assembled and positioned within the drum **31**. As shown in the drawings, the ribbon is fluted along its opposite edges so that the marginal edges of the ribbon have a sinuous appearance as upper outwardly curved flutes **40** are bent alternately over the upper edges of contiguous convolutions of the helically coiled element **38** and oppositely bent flutes **41** extend around the alternate lower sides of the convolutions of the element **38**, as particularly shown in Fig. 3 of the drawings. By this arrangement it will be seen that the convolutions of the heating element will be securely assembled and will maintain their aligned position within a flat plane at the upper end of the drum **31**. It is to be understood that the wire forming the element **38** and the ribbon forming the element **39** are preferably made of a metal which readily becomes incandescent when heated. A suitable metal of this type is known to the trade as "nicrome" steel. This material is commonly used in making heating elements for various electrical devices.

Attention is directed to the fact that at the vortex of the spiral forming the mantle a central opening **42** occurs. This opening is disposed directly above the upper open end of the ignition tube **27**. This makes it possible for a match to initially ignite the gas above the mantle after which the flame ignites the gaseous fuel being projected as a jet from the tube **27**. The burner will then be ignited and the flame above the mantle will die out.

In operation of the present invention the structure is assembled as shown in the drawings and the tube **14** is connected to a suitable source of fuel. This fuel is preferably a gaseous fuel, which when delivered to the burner **20** will produce a combustible gas. The member **19** is regulated with relation to the opening to supply a desired amount of oxygen to support combustion in the fuel. The gas then passes out into the drum through the openings **24** and **25** of the burner and also through the opening **28**, which will project a jet of gas upwardly through the tube **27** and toward the vortex opening **42** in the mantle **37**. An igniting means is then 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 **27** and then ignite the burner. As the gas burns at the end of the ignition tube it will ignite the gas being projected through the openings **24** and **25** of the burner. At this time the burner will be in full operation, and as the combustion takes place within the drum **31** the mantle **37** will be heated to the point of incandescence. Attention is directed to the fact, however, that although the gas is burning within the drum it does not pass through the mantle and burn, and in fact it is for this reason that the vortex opening **42** is provided, since it is bound that any attempt to ignite the gas which passes through the mantle **37** will not kindle a fire in the burner and might cause sufficient gas to accumulate around the burner to produce an explosion. It is to be understood that as the burner operates air will be drawn in around the disc **35** and through the throat **26** to support combustion within the drum.

For the purpose of increasing the heat radiating surface of the structure a fluted strip **43** is arranged around the perimeter of the drum **31** and substantially in the same plane as the mantle **37**.

By reference to Fig. 4 of the drawings it will be seen that a slightly different form of central opening **44** makes it possible for a mantle of different configuration to be made, and it will be obvious that numerous variations of this arrangement can be carried out.

It will thus be seen that the structure here disclosed provides simple and effective means for heating air by radiation 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.

While we have shown the preferred form of our invention as now known to us, it will be understood that various changes may be made in combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of our invention as claimed.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. A heating structure comprising a cylindrical drum with its axis disposed vertically, a foraminous mantle disposed across the top of said drum, a burner structure disposed adjacent the lower edge of said drum and enclosed thereby, a disc-shaped shield disposed beneath the burner structure and within the drum, said shield being of a diameter less than that of the drum whereby an annular air passageway will be formed, and a baffle ring mounted within the drum in a plane parallel to the shield and thereabove, said ring having an opening of lesser diameter than the outer circumference of the shield whereby an annular sinuous path of travel will be provided for the air flowing into the drum.

2. The heating structure set forth in claim 1 wherein the diameter of the burner is less than that of the baffle ring.

3. A burner structure comprising a cylindrical drum with its central axis disposed vertically, a foraminous mantle mounted across the upper end of said drum, a burner within the drum lying in the transverse plane thereof and adjacent its lower end, said burner being formed with a plurality of upwardly directed circumferential fuel outlet openings, fuel supply means for the burner, a circular shield plate disposed beneath the burner and circumscribed by the lower edge of the drum, said shield plate being of an outer diameter less than the inner diameter of the drum, whereby an annular air passageway will be provided, an annular baffle ring supported within the drum and disposed in the transverse plane parallel to the burner and the shield and above the burner, whereby the air passing upwardly through the drum will flow around the outer circumference of the disc and will be directed inwardly toward the burner as it passes upwardly through the opening in the baffle ring.

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