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3,044,538

RADIATING OR INCANDESCENT GAS BURNER

Filed Sept. 4, 1957

FIG.1

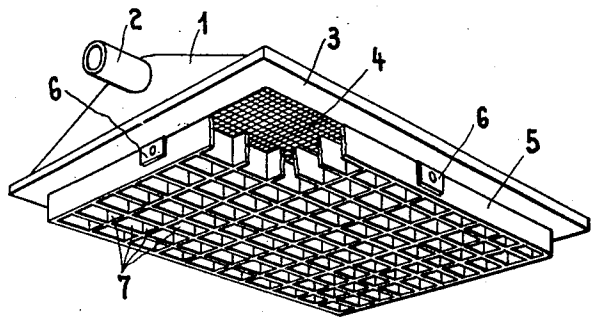


FIG.2

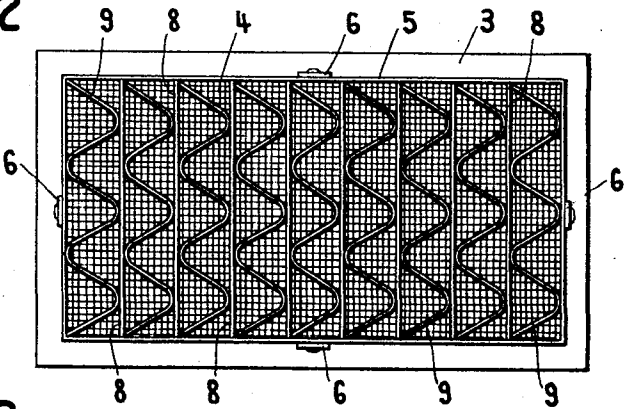


FIG.3

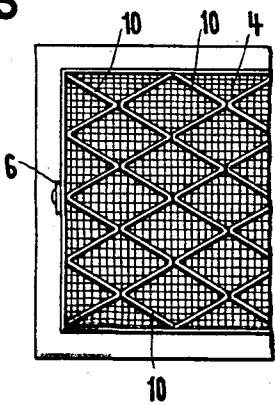


FIG.4

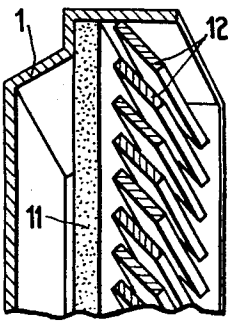
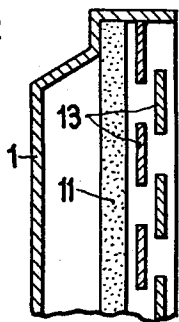


FIG.5



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3,044,538

RADIATING OR INCANDESCENT GAS BURNER
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4 Claims. (Cl. 158—116)

This invention relates to a radiating or incandescent burner of the type in which a combustible mixture flowing through a gas-pervious burner diaphragm burns in an areal or laminar combusting zone at the burner surface.

In radiating burners of this type an external burner diaphragm, for instance a porous or finely perforated plate of ceramic or sintered material or at least one or gas-pervious envelopes, for instance wire screens, laid upon each other, is heated to incandescence by the said areal combusting zone at the burner surface. An appreciable portion of the heat produced by burners of this kind is heat radiation emitted from the said incandescent burner diaphragm, and therefore these burners are particularly adapted for radiation heating in roasting and drying ovens or for heating of the ambience of market or exhibition booths, show windows and the like in halls or in the open air. However, the external, gas-pervious diaphragms of these radiating burners are very delicate and are easily damaged by mechanical shocks or pressures, and the abovementioned ceramic plates are easily damaged by humidity and they are liable to cracking due to the very intensive and sudden regional cooling thereof when spatter or raindrops fall onto the incandescent plates. Moreover, the burner operation is affected by air current or draught in that the burner flame starts to flicker and the combustion tends to flash back behind the burner diaphragm even at rather moderate air draughts. It is possible to provide protecting means in front of the burner surface in order to avoid the above detrimental influences, but such protecting means will substantially reduce the heating and radiating capacity of the burner and therefore no satisfactory solution has been found up to date for doing away with the above mentioned heavy drawbacks.

It is an object of this invention to provide an effective protection for the radiating burner against the said detrimental influences without unduly reducing the burner efficiency. The radiating or incandescent burner according to this invention broadly comprises at least one additional radiating face arranged outside and contiguous to the burner surface and within the direct heating range of the said combusting zone. Preferably a grate-shaped structure constituted by a number of additional radiating faces, for instance a honeycomb grate or a grate made of lamellas arranged parallel to each other, may be provided. It was found that with a honeycomb grate having openings limited by walls standing at least approximately perpendicular to the burner surface, a perfect protection of the burner against the said detrimental external influences is obtained and moreover the burner efficiency is substantially improved because the additional radiating faces situated in the direct heating range of the combusting zone are also heated to relatively high temperatures and therefore substantially add to the heat radiation of the burner.

The attached drawings show, by way of example, some embodiments of the invention.

FIG. 1 is a perspective view of a first embodiment of the burner having a honeycomb grate.

FIGS. 2 and 3 are views of two further embodiments having individually designed honeycomb grates and

FIGS. 4 and 5 are schematic partial sections of radiat-

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ing burners having grates of lamellas arranged in parallel planes.

The burner shown in FIG. 1 has a burner body 1, a mixing tube 2 and a flat external burner diaphragm 4 mounted in a flange 3 of the burner body 1. So far the burner may be of the type disclosed in my copending patent application No. 575,873 wherein the burner diaphragm comprises two or more thin wire gauzes preventing flash-back of the combustion and whereof at least the outermost is heated to incandescence and the burner operation is similar to the one described in the above prior patent application. A grate 5 made of metal tapes standing perpendicular to the burner surface 4 is attached to the flange 3, preferably by means of lugs 6 fixed on the flange 3. The flat tapes 7 of the grate 5 are arranged in mutually perpendicular planes and are fit into each other at the intersecting points. They constitute a honeycomb system of walls delimiting chambers or openings and avoiding admission of air draughts to the burner diaphragm 4 and mechanical damaging of the latter. This grate of tapes vertically arranged on the burner surface does not appreciably reduce the heat radiation from the burner surface, such heat radiation passing unhindered through the openings of the grate 5. Since the grate 5 is very close to the burner diaphragm 4 or contacts the same it is located within the direct heating range of the combustion zone of the burner and is heated at least partially to incandescence so that the walls of the grate 5 constitute additional radiating surfaces substantially adding to the heat radiation of the burner. Therefore, the efficiency of the burner is improved by the grate 5, because more radiating heat is produced and less heat is carried away by the hot gases leaving the burner as compared with a burner having no grate 5 but only a radiating burner diaphragm 4. Due to the grate 5 the heat radiation is reflected substantially into the direction of the axis of the grate openings so that the heating effect of the burner may easily be concentrated to a relatively small object or space to be heated, for instance to the good to be treated in drying, baking or roasting ovens.

The openings of the grate 5 may preferably have a quadrangular cross section and the width of such openings may preferably be chosen between 20 and 25 mm., whereas the depth of the grate openings may preferably be of approximately the same size, for instance from 15 to 25 mm. With a grate of these dimensions the burner has operated reliably at wind intensities of 40 km./h. The thickness of the tapes from which the grate 5 is built up, is preferably about 0.5 mm. and it was found that tapes of this thickness are rapidly heated to incandescence when the burner is set to operation. The tapes of the grate 5 are made of a refractory material, preferably a metal.

In FIGS. 2 and 3 corresponding parts of the burner are designated with similar reference numbers as in FIG. 1. FIG. 2 shows a grate 5 made of flat, straight tapes 8 and of corrugated tapes 9. Chambers or openings of substantially triangular section are formed between the straight tapes 8 and the corrugated tapes 9, the admission of air draughts to the burner diaphragm 4 being prevented by such chambers in the manner set out above with reference to the grate 5 shown in FIG. 1. The grate 5 illustrated in FIG. 2 does not require crossing of the tapes as shown in FIG. 1 and therefore no recesses are necessary in the intersecting places of the tapes for fitting the tapes into each other. The apex places of the corrugated tapes 9 shown in FIG. 2 may be connected to the flat tapes 8 and to the rim portion or frame of the grate 5 by welding, riveting or the like.

The grate 5 shown in FIG. 3 is made of zig-zag shaped corrugated tapes 10 except for its rim or frame portion

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which latter is made of straight tapes. The tapes 10 contact each other in their apex places and may be connected to each other in these places. Openings or chambers of triangular shape are formed along the frame portion of the grate and openings or chambers of rhombic shape are formed in the center of the grate between the corrugated tapes, such chambers or openings preventing admission of air draughts to the burner diaphragm.

FIG. 4 schematically shows a burner having a burner body 1 and an external burner diaphragm made of a porous plate 11 of sintered or ceramic material mounted in the burner body 1. A grate of refractory lamellas 12 arranged parallel to each other and at an angle to the burner surface, is mounted in a projecting frame of the burner body 1 in a position immediately above the burner diaphragm 11. The lamellas 12 are heated to a very high temperature by the heat radiated from the incandescent plate 11 and by the hot combustion gases leaving the burner through the slit-shaped openings formed between adjacent lamellas 12, the so heated lamellas 12 forming additional heating faces and adding substantially to the heat radiation of the burner. The heat radiation emitted by the incandescent outer surface of the plate 11 passes through the slits formed between lamellas 12 and is reflected downwardly. In the position illustrated in FIG. 4 the burner may preferably be used for heating purposes out of doors, whereby the heat radiation is reflected downwardly from the burner arranged in an elevated position. The grate of lamellas 12 not only prevents admission of air draughts to the burner surface, but rain or snow cannot reach the burner surface formed on plate 11. The plate 11 is also effectively protected against mechanical damage by the grate of lamellas 12 arranged in front of the burner.

All the lamellas 12 may be rotatably mounted on individual shafts and may commonly be brought to any desired angular position by means of a suitable adjusting mechanism, in order to change the radiating direction of the burner.

The burner shown in FIG. 5 is similar to the burner illustrated in FIG. 4 and corresponding parts have been designated in FIG. 5 in the same way as in FIG. 4. However, the burner of FIG. 5 has a grate of laterally overlapping lamellas 13 arranged in parallel planes to the burner surface. Direct radiation from the radiating outer surface of plate 11 through the gaps formed between the lamellas 13 is relatively limited and the major part of the heat radiation is emitted by the lamellas 13 which are heated to incandescence by the heat radiation from the burner diaphragm 11 and by the hot combustion gases leaving the burner through the gaps between lamellas 13.

Instead of grates made of a number of lamellas or tapes, as shown in the drawing, one single additional radiating face, for instance a perforated metal sheet or the like may be provided. As an example, the grate illustrated in FIG. 4 may be replaced by a metal sheet having portions thereof pressed out of its plane to form passages for the heat radiation and for the combustion gases leaving the burner.

The burner shown in the drawing are not only suitable for heating purposes out of doors or in large locals, where such burners are exposed to air draughts, but the burners are also excellently suited for use in baking, roasting, grilling and drying ovens where concentrated heating of a quantity of food is required. The burner is particularly suitable for use in drying ovens through which a stream of drying air is set up because the air draught does not injure operation of the burner for the reasons explained above.

It may be important to arrange the burner grate of the embodiments shown in FIGS. 1 to 4 in direct contact with the external diaphragm 4 and 11 respectively of the radiating burner in order to prevent compensating air

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or gas streams along the burner diaphragm between adjacent openings or chambers of the grate.

While the invention has been described and illustrated with reference to specific embodiments thereof, it will be understood that other embodiments may be resorted to without departing from the invention. Therefore, the forms of the invention set out above should be considered as illustrative and not as limiting the scope of the following claims.

What I claim is:

1. A radiant heater comprising a hollow body having a mixing chamber portion within which a combustible gaseous fuel-air mixture is formed, said chamber having a large discharge opening, a burner diaphragm comprising at least two thin wire gauzes substantially in contact with each other and forming a burner surface covering said opening and presenting means for controlling and localizing the burning fuel-air mixture such that combustion takes place in the region of such diaphragm with at least the outer of such gauzes being heated to incandescence, a metallic grate associated with said diaphragm for protecting the same from physical damage and from the influence of draughts and for enhancing the radiant heat characteristics of the burner, said grate including a series of strip-shaped elements extending in intersecting planes substantially perpendicular to the surface of the burner diaphragm to form honeycombed openings having axes substantially perpendicular to the burner surface, the strip shaped elements having a thickness much smaller than the width of the openings formed between said elements and most of the heat radiation emitted from the burner surface being thereby allowed to pass freely through such openings and the heat radiation being substantially reflected into the openings and emerging therefrom substantially perpendicular to the burner surface, said grate overlying the entire burner diaphragm area and being generally parallel therewith, said elements cooperating to form draught deflecting means to substantially isolate that region of the burner between the outer surfaces of said elements inwardly thereof toward and to said diaphragm from ambient air currents, said grate being disposed exteriorly of said diaphragm immediately adjacent thereto so that the inner portions of the strip-shaped elements substantially contact the diaphragm and are thereby heated to incandescence to enhance the radiant heating characteristics of the burner.

2. The heater according to claim 1 wherein the strip-shaped elements of said grate are formed in reticulated fashion with all of such strip-shaped elements intersecting at right angles.

3. The heater according to claim 1 wherein said strip-shaped elements include a plurality of spaced parallel strips and intermediate the same a series of serpentine strips extending between adjacent pairs of the parallel strips.

4. The heater according to claim 1 wherein each of said strip-shaped elements is of zig-zag configuration with the apices thereof being joined to form individual cells therebetween.

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