March 13, 1962 G. BELLO 3,024,836

RADIATING THERMIC ELEMENT WITH CATALYTIC GAS OXIDATION

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FIG. 2

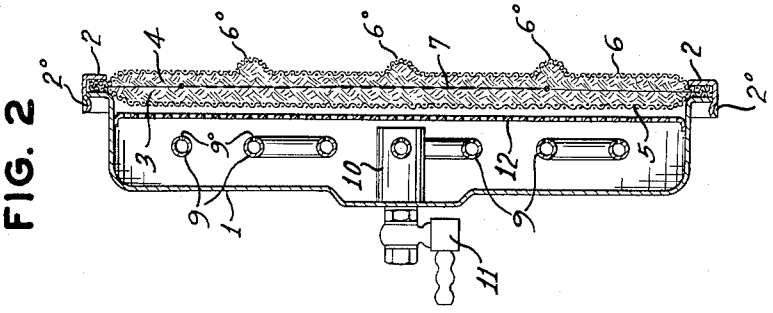
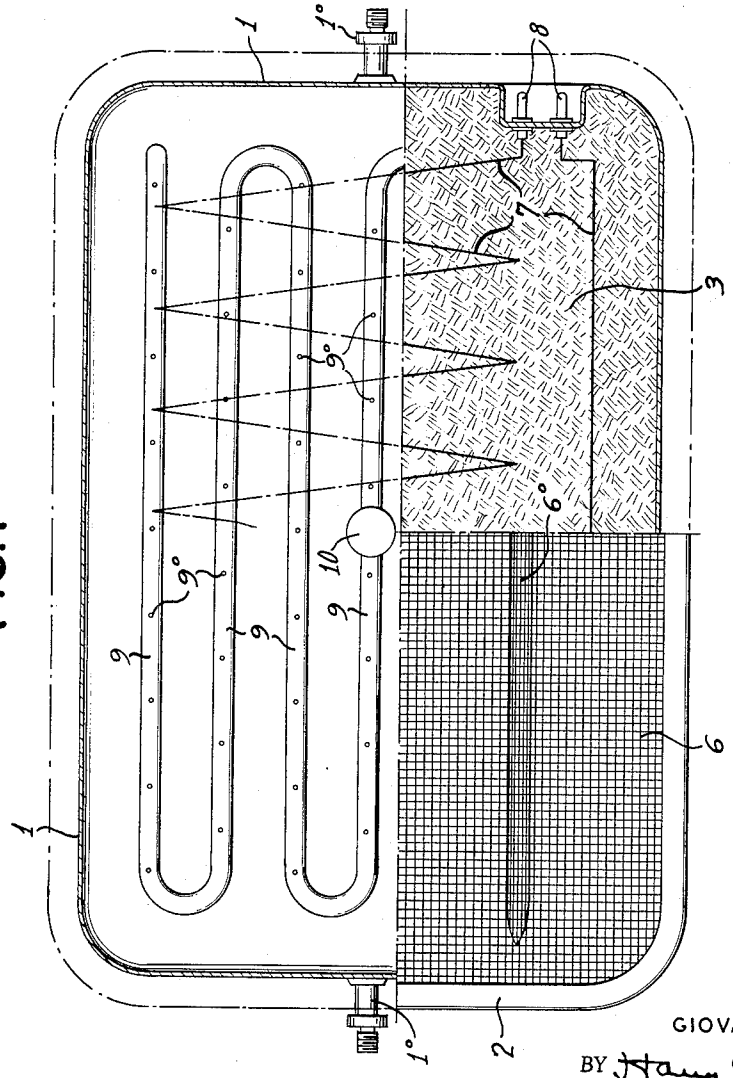


FIG. 1



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FIG. 4

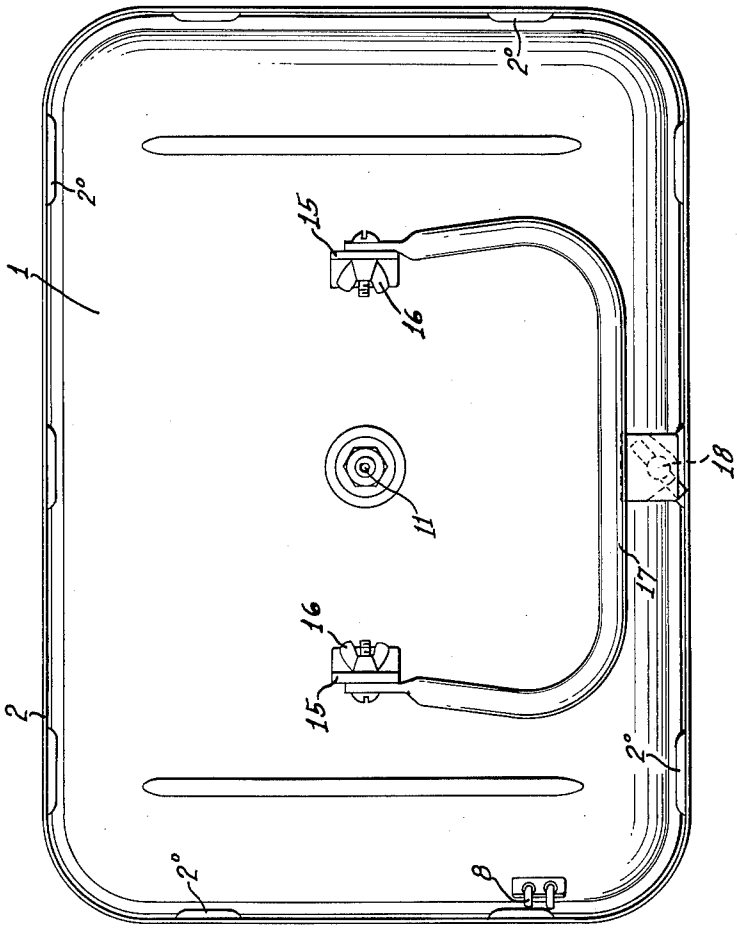
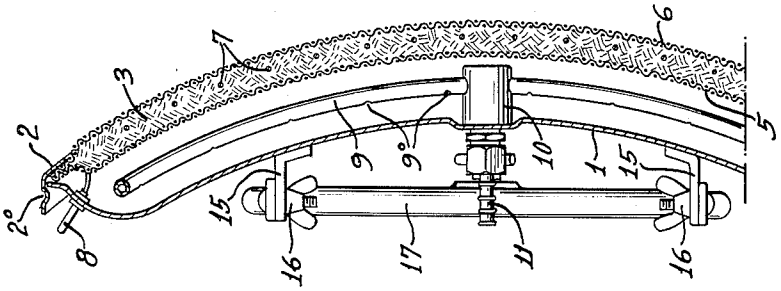


FIG. 3



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RADIATING THERMIC ELEMENT WITH CATALYTIC GAS OXIDATION

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FIG. 6

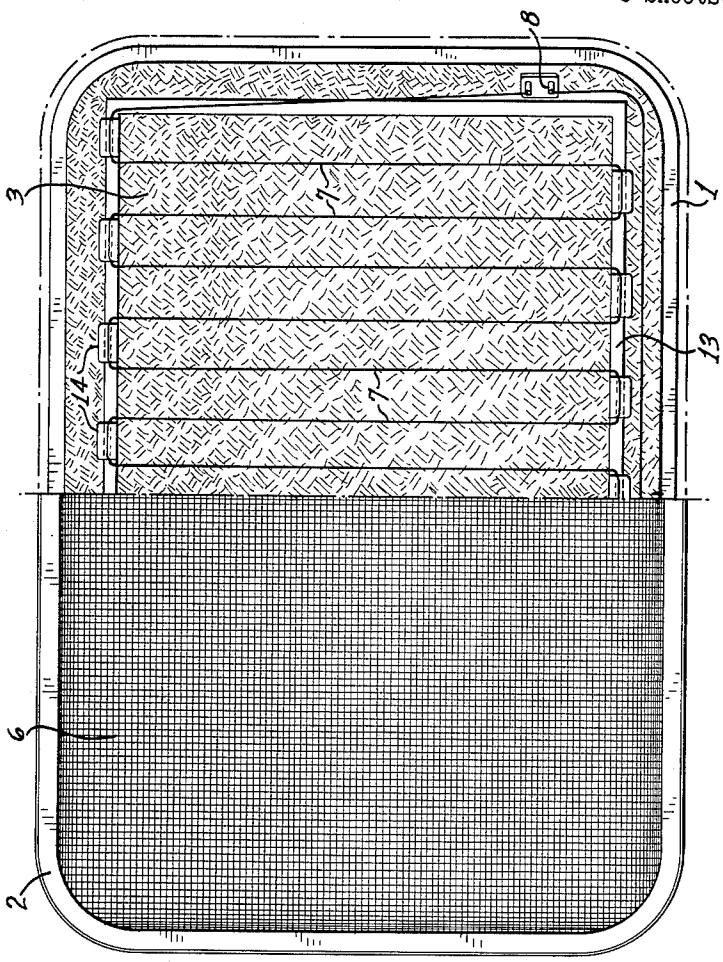
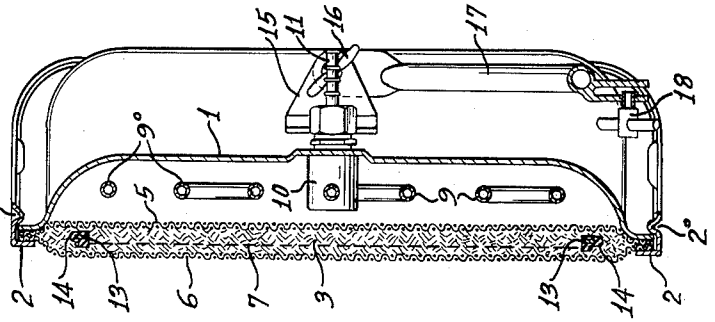


FIG. 5



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3,024,836
RADIATING THERMIC ELEMENT WITH CATALYTIC GAS OXIDATION

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4 Claims. (Cl. 158—114)

It is known that thermic elements which function by catalytic oxidation of gas can afford satisfactory results only when a very uniform feeding of the gas is effected on the whole internal area of the catalytic mass and when equally uniform preheating is exerted on the mass itself.

The present invention has for an object the provision of a radiating thermic element which functions by catalytic oxidation of gas, characterized by peculiarities which allow to obtain, together with a simple and strong construction, the best working conditions, especially regarding the feeding and the preheating uniformity.

The accompanying drawings illustrate by way of example only, an embodiment of the invention as well as a modification thereof. In the drawings:

FIGURE 1 is a front elevation of a thermic element partly sectioned to show the feed space in the upper half of the drawing and to show the electric preheating resistance in the catalytic mass, in the lower right-hand quarter of the drawing.

FIGURE 2 is a vertical cross-section;

FIGURE 3 is a section on the line III—III in FIGURE 4;

FIGURE 4 is a rear view of a modified form of thermic element according to the invention;

FIGURE 5 is a section on the line V—V in FIG. 4; and

FIGURE 6 is a front elevation of the thermic element shown in FIGURE 4, having the protection grate and a portion of the catalytic mass removed on the right-hand side, in order to show the disposition of the preheating resistance.

With reference to the first embodiment illustrated in FIGURES 1 and 2, the numeral 1 indicates a casing which constitutes a diffusion chamber for the gas and a supporting frame for the element. It is provided with supporting means, for example threaded pivots 1°.

A catalytic unit comprising two layers of active material 3, 4 sandwiched between two sheets of wire gauze 5, 6 or other perforated material, is located across the open front end of the casing 1 and held in position by means of a frame 2 which is secured to the front edge of the casing by means of a bead 2° or by means of bolts, rivets or the like.

The sheets of wire gauze 5, 6 or at least the sheet 6 which is most likely to be subjected to damage or deformation as a result of heat expansion, is stiffened by forming transverse corrugations 6° therein.

A preheating electric resistance 7 is disposed between the layers of active material 3, 4. This disposition and particular formation facilitates uniform heating of the catalytic mass and ensures a satisfactory start of the element without any unburned gas leaking through the catalytic mass during the first moments of starting.

The preheating resistance 7 is connected to terminals 8 located at the side of the casing 1 and may be composed of two or more sections in order to adapt the apparatus to power supplies of different voltages, should this be necessary.

Uniform feeding of gas to the catalytic mass in order to ensure uniform pressure on the inner face thereof, is obtained by providing a zig-zag feed pipe 9 within the

casing 1. The feed pipe 9 is closed at both ends and is connected at its middle portion 10 to a gas inlet connection 11. The feed pipe 9 is provided along its length with preferably equi-distantly spaced outlet holes 9° to ensure uniform distribution of gas within the casing 1 and thus to eliminate any possible pressure differences on the catalytic mass.

The pipe 9 may, of course, be provided in any other suitable conformation, for example, spiral, instead of the zig-zag conformation shown in the drawings. The main consideration, however, should be to obtain a uniform distribution of gas within the casing 1.

Gas for the thermic element is preferably supplied through a pressure reducer. The reducer may be of the variable type in order to enable heat control of the thermic element and thus to make it adaptable for a variety of practical uses.

In order to assist in obtaining a uniform distribution of gas, a perforated sheet 12 may be inserted between the feed pipe 9 and the catalytic mass.

Nearly all the constructional and functional features described above can be applied also to the modification shown in FIGURES 3 to 6. In these figures numerals corresponding to those used in FIGURES 1 and 2 indicate like parts or parts of a similar character.

One characteristic of the modification is that the element is non-planar, i.e., curved at least in one direction. In the embodiment illustrated in FIGURES 3 to 6, the curvature is around a vertical axis.

The curved shape of the element has several advantages. Principally, it ensures radiation of heat over a larger area of a room to be heated. It also enhances rigidity of the wire gauze sheets 5, 6 containing the catalytic mass and the stiffening corrugations which were provided in the embodiment previously described, can be dispensed with. Furthermore, it is better from an aesthetic point of view and when the supporting members of the element are provided on the back thereof, allows them to be substantially hidden from view.

Another characteristic of the modification is the particular arrangement of the preheating electric resistance. As shown, the resistance has a regular undulating form and is supported by a light frame 13 made, for example, from sheet metal and provided along its longitudinal sides with small insulating carriers 14 made, for example, from steatite. The insulating carriers are each provided with a groove through which the resistance wire or ribbon is threaded from one carrier to another in parallel lines so as to be uniformly spread over the catalytic mass and thus ensure uniform heating thereof.

A feed pipe 9 of zig-zag conformation is located within the casing 1 in the same way as that shown in FIGURES 1 and 2 and is also adapted to be connected to the gas supply as already described. There is one difference, however, namely, that the gas outlet holes 9° are provided towards the rear of the thermic element instead of facing directly towards the catalytic mass. It is possible—all other things being equal—in this way to obtain an even more uniform supply of gas to the catalytic mass.

A further characteristic of the modified thermal element is its supporting means. Two brackets 15 are provided on the casing 1 and extremities of a U-shaped supporting element 17 which is secured to the brackets by means of bolts and wing nuts 16 or the like. The base part of the supporting element has a clamp 18 secured thereto which clamp can be fastened directly onto an edge of a gas flask when such flask is used as a source of supply. In this case the flask itself serves as a supporting base for the thermic element and it may be carried on a vehicle to facilitate transport of the device. It will be appreciated that the clamp 18 can be varied to suit different types of mountings, for example, wall or ceiling

mountings. By loosening the wing nuts **16**, it is possible to adjust the element in any desired position in order to direct the heat to the best advantage.

The feed pipe **9** can be made from stainless metallic material, e.g., nickel-chromium steel, or, and preferably, of tubular sections or refractory material (steatite, porcelain, etc.) provided with holes **9°** and connected together by semi-circular joints of the same or other suitable material.

The perforated sheet **12** (if provided) may also be of stainless metal or refractory material, particularly asbestos-cement conglomerate such as eternit.

With the arrangements described in the foregoing, catalytic oxidation takes place in the catalytic mass and heat is emitted in the form of dark radiation (infrared) without flame or incandescence and without any leakage of unburned gases, smoke or carbon monoxide.

The thermic elements according to the present invention are therefore quite suitable for the heating of dwelling houses as they do not require the provision of exhaust pipes or chimneys.

I claim:

1. A catalytic heater for operation with gaseous fuels comprising, a housing having a wall and an opening opposite said wall, a catalytic mass covering said opening and comprising a pair of layers of catalytic material in face to face relation, electric resistance means disposed between said layers and extending across substantially the entire confronting surfaces of said layers for the uniform preheating thereof, said housing defining a gas distribution chamber between said wall and said catalytic mass, and fuel distribution means disposed in said chamber and comprising a pipe arranged in undulated configuration along the cross section of said chamber and having spaced fuel outlet holes to distribute the fuel uniformly in the chamber, said pipe being in fluid communication with a fuel inlet conduit.

2. A catalytic heater for operation with gaseous fuels comprising, a housing having a wall and an opening opposite said wall, a catalytic mass covering said opening and comprising a pair of layers of catalytic material in face to face relation, electric resistance means disposed between said layers and arranged in undulated configuration across substantially the entire confronting surfaces of said layer for the uniform preheating of said catalytic mass, said housing defining a gas distribution chamber between said wall and said catalytic mass, and fuel distribution means disposed in said chamber and comprising a pipe arranged in undulated configuration along the cross section of said chamber and having spaced fuel outlet holes to distribute the fuel uniformly in the chamber, said pipe being in fluid communication with a fuel inlet conduit.

3. A catalytic heater for operation with gaseous fuels comprising a housing having a wall and an opening opposite said wall, a catalytic mass covering said opening and comprising a pair of layers of catalytic material in face to face relation, electric resistance means disposed between said layers and arranged in undulated configuration across substantially the entire confronting surfaces of said layer for the uniform preheating of said catalytic mass, said housing defining a gas distribution chamber between said wall and said catalytic mass, and fuel distribution means disposed in said chamber and comprising a pipe arranged in undulated configuration along the cross section of said chamber and having spaced fuel outlet holes to distribute the fuel uniformly in the chamber, said pipe being in fluid communication with a fuel inlet conduit, and a mesh screen provided in said housing between said catalytic mass and said distribution means in spaced relation therewith for more uniformly distributing the fuel to said catalytic mass.

4. A catalytic heater for operation with gaseous fuels comprising, a housing having a wall and an opening opposite said wall, a catalytic mass covering said opening and comprising a pair of layers of catalytic material in face to face relation, electric resistance means disposed between said layers and extending across substantially the entire confronting surfaces of said layers for the uniform preheating thereof, said housing defining a gas distribution chamber between said wall and said catalytic mass, and fuel distribution means disposed in said chamber and comprising a pipe arranged in undulated configuration along the cross section of said chamber and having spaced fuel outlet holes to distribute the fuel uniformly in the chamber, said pipe being in fluid communication with a fuel inlet conduit, said fuel outlet holes being in confronting relation with said wall.

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