Feb. 13, 1951 H. S. LEO ET AL 2,541,428

SHEET METAL GAS BURNER WITH GRID OUTLET MEMBER

Filed April 12, 1946 2 Sheets-Sheet 1

Fig. 1

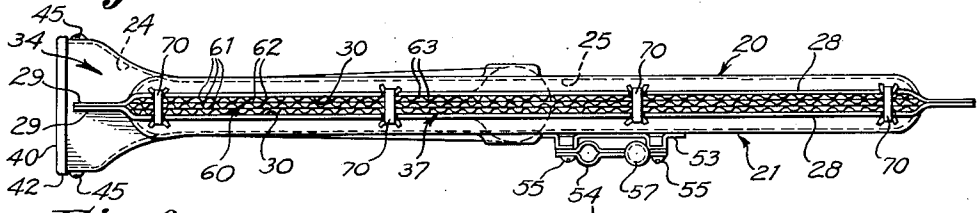


Fig. 2

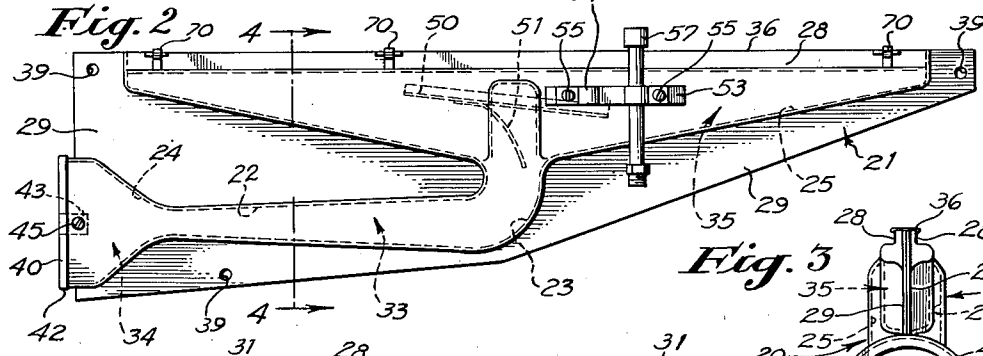


Fig. 3

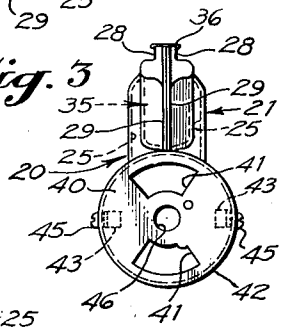


Fig. 5

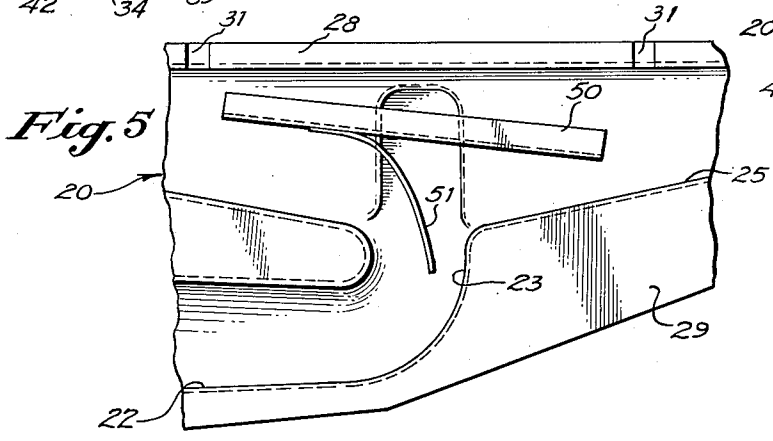


Fig. 6

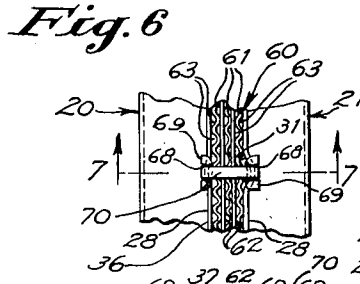


Fig. 4

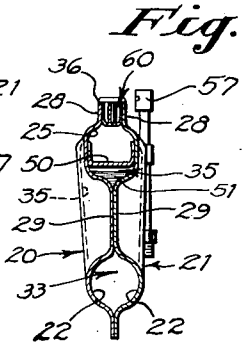
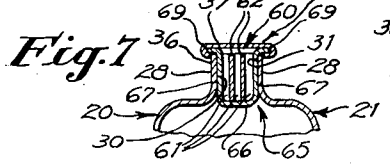


Fig. 7



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SHEET METAL GAS BURNER WITH GRID OUTLET MEMBER

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Fig. 8

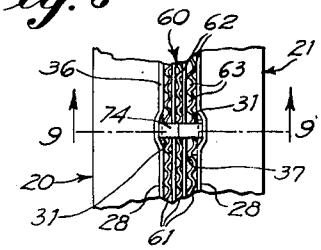


Fig. 10

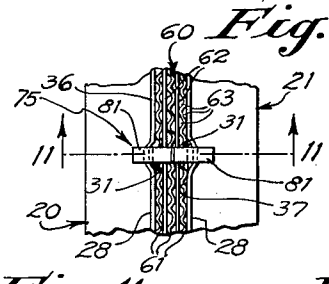


Fig. 9

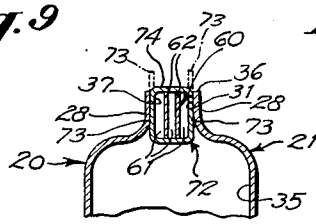


Fig. 11

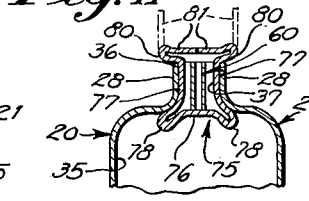


Fig. 12

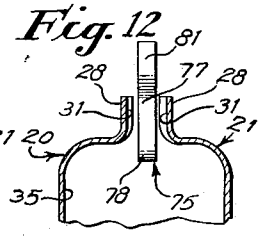


Fig. 13

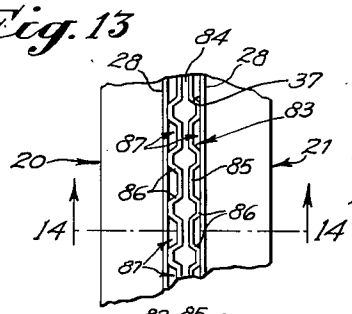


Fig. 15

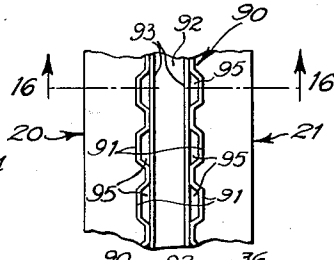


Fig. 14

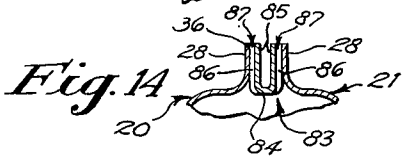
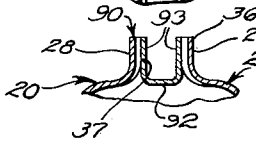


Fig. 16



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Patented Feb. 13, 1951 2,541,428

UNITED STATES PATENT OFFICE

2,541,428

SHEET METAL GAS BURNER WITH GRID OUTLET MEMBER

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Application April 12, 1946, Serial No. 661,688

8 Claims. (Cl. 158—116)

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This invention relates to burners used in various types of gas-fired heating equipment, such as in space heaters, central heating apparatus, ovens, and similar equipment wherein combustible gas is employed as the heating medium.

Various types of burners are employed in such gas heating equipment and usually consist of a cast iron gas-mixing member having a series of relatively small openings through which the gas and air mixture flows, the small streams or jets of the combustible gas mixture being ignited to burn in small flames. Such gas burners are extremely heavy and add considerable weight to the apparatus in which they are incorporated, thus making it difficult to move the apparatus in the home or other establishment and increasing the cost of shipment of the gas burning equipment. Moreover, such castings are of a relatively complicated nature and special skill is required in the fabrication thereof. Since iron castings are subject to "blow holes" or other imperfections and are easily cracked or otherwise damaged during handling, the cast burners quite often have small openings through which gas may escape and replacement of the burners becomes necessary. In addition, such burner castings do not lend themselves to the inexpensive mass production methods which have been evolved for the fabrication of the other components of the heating equipment to which the burners are applied, and thus the cost of producing the castings is proportionately greater and the overall cost of the heating equipment is substantially increased. Furthermore, cast burners are subject to corrosion and rusting and the combined action of moisture and heat deteriorates the burners, especially adjacent the end where combustion of the gas takes place.

A primary object of our invention is to provide a gas burner of an improved light-weight sheet metal construction and one which lends itself to inexpensive mass production methods.

Another object is to provide a gas burner composed of two mating sections which may be stamped from sheet metal and welded or otherwise joined together to form a gas-tight structure.

Another object is to provide a gas burner in which the mating sections are provided with depressions which, when the sections are joined together, cooperate to provide a delivery passage which communicates with a manifold chamber having a mouth or discharge passage from which the combustible mixture emanates to be burned.

Another object is to provide a gas burner of hollow construction which may be made from corrosion-resisting metal or from other material

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having its inner and outer surfaces enameled or otherwise coated to render the burner rust-proof and enhance its appearance.

Another object is to provide a burner of the character referred to having a manifold chamber, the sides of which are extended to form lips defining a discharge passage through which the combustible gas mixture flows and in which is disposed a burner element.

Another object is to provide a burner element comprising a series of corrugated grid members of corrosion- and rust-proof metal, said corrugations providing orifices or nozzles through which the combustible gas mixture discharges to burn thereabove.

Another object is to provide a grid-like burner element which may be readily positioned in the discharge passage of the burner without the use of special tools and without special skill on the part of the workman.

Another object is to provide several types of burner elements, either of a removable or immovable type, adapted for economical manufacture from sheet metal stampings.

Further objects of our invention will appear from the following specification and the drawings, which are intended for the purpose of illustration only, and in which:

Fig. 1 is a plan view of a gas burner constructed in accordance with our invention;

Fig. 2 is a side elevation of the gas burner;

Fig. 3 is an end view of the inlet end of the burner;

Fig. 4 is a cross-sectional view, taken on line 4—4 of Fig. 2;

Fig. 5 is a fragmentary longitudinal section through the burner on a medial plane, showing one sheet metal section in elevation and showing the gas deflector member;

Fig. 6 is a fragmentary plan view showing the preferred means for connecting the burner element to the burner unit;

Fig. 7 is a cross-sectional view on line 7—7 of Fig. 6;

Fig. 8 is a partial plan view similar to Fig 6, showing a modified means for connecting the burner element in place;

Fig. 9 is a cross section taken on line 9—9 of Fig. 8;

Fig. 10 is a partial plan view of another alternative means for connecting the burner element;

Fig. 11 is a cross section taken on line 11—11 of Fig. 10;

Fig. 12 is a view similar to Fig. 11, illustrating the method of connecting the element-retaining means in the mouth of the burner;

Fig. 13 is a partial plan view of a further modified form of burner element;

Fig. 14 is a cross section taken on line 14—14 of Fig. 13;

Fig. 15 is a fragmentary plan view of a still further modified type of burner element; and

Fig. 16 is a cross-sectional view on line 16—16 of Fig. 15.

Our improved gas burner comprises, in general, a gas burner unit formed essentially from two mating sheet-metal sections suitably joined together and provided with a mixing chamber in which gas and air are admixed, a delivery passage communicating at one end with the mixing chamber and at the other end with a manifold passage or chamber into which the air and gas flow, said manifold passage or chamber being provided with lips defining a discharge passage through which the combustible gas-air mixture discharges, combustion of the mixture taking place adjacent the passage. A burner element is disposed within the discharge passage and comprises one or more corrugated members or grids for dividing the passage into a series of small orifices through which the combustible gases discharge. The improved gas burner also includes gas deflecting means for equally distributing the gas mixture within the manifold chamber, pilot means for igniting the gas-air mixture flowing from the orifices, and valve means for regulating the quantity of air entering the burner.

Referring first to Figs. 1 to 5, the improved gas burner consists essentially of a pair of mating sheet metal sections 20 and 21 which may be of any desired configuration in side elevation. Each section 20 or 21 consists of a sheet metal plate which is extruded or deformed to provide a longitudinally-extending depression 22 of semi-circular cross section, the depression 22 being provided with a curved portion 23 of similar cross section and a flaring portion 24, suggested in Fig. 2. Above the longitudinally-extending depression 22, the metal is extruded or deformed to provide a substantially triangular depression 25, which communicates with the curved portion 23. The upper lip 28 of each section 20 and 21 is pressed or deformed outwardly to lie out of the plane of the plate portions 29 of the sections to provide a longitudinally-extending recess 30. The lip 28 of each section 20 and 21 is further pressed or deformed outwardly at several spaced points to provide vertical grooves 31.

The two mating sheet metal sections 20 and 21 are placed together with their plate portions 29 in engagement and with the several depressions and recesses respectively in alignment, and the plate portions are preferably spot welded at points adjacent the depressed areas to provide a unitary structure. The abutting plate portions 29 of the sections 20 and 21 may be further seam-welded along lines close to the depressed areas to effect a gas-tight burner unit. While a preferred method of joining the two sections 20 and 21 has been explained above, it is to be understood that other methods of securing these parts together may be employed. For example, the sections may be brazed together or joined by means of bolts or rivets and a suitable gasket or other sealing means interposed between the two sections to provide a gas-tight union. In other instances, the two mating sections may be connected by a simple lap or lock seam, commonly employed in the fabrication of sheet metal objects.

It is to be noted by reference to Fig. 4 that, when the two sections 20 and 21 are thus welded

or otherwise joined together, the longitudinal depressions 22 and curved depressions 23 cooperate in providing an angular delivery passage 33 of circular cross section having a flared mixing chamber 34, also of circular outline and formed by the flaring portions 24. The triangular depressions 25 also align to effect a hollow manifold chamber or passage 35 adapted to receive the air and gas mixture from the delivery passage 33. When the two sections 20 and 21 are joined together, the lips 28 define a mouth-like structure 36 having a longitudinal passage 37 through which the combustible gas mixture is adapted to flow. The sections 20 and 21 may have aligned holes 39 for receiving bolts or pins for mounting the burner unit in a heating apparatus.

Attached to the outer ends of the flared portions 24 of the burner unit is a disc 40 (Fig. 3) which forms one member of a conventional air valve structure for regulating the ingress of air into the burner unit, the disc being provided with arcuate openings 41 through which the air enters the mixing chamber 34. The disc 40 has a circumferential flange 42 which overlies the periphery of the flared portions 24 and is also provided with ears 43 having threaded holes for receiving screws 45 inserted through holes in the walls of the flared portions 24. The disc 40 has a central hole 46 for receiving the end of a gas tube or jet member. The usual adjustable apertured plate is positioned against the outer face of the disc 40 to cooperate therewith in varying the effective sizes of the openings 41. Since this type of air-regulating means is well known, it is not herein shown or described in detail.

Referring to Figs. 4 and 5, a channel member 50 is positioned within the triangular manifold chamber 35 before the sections are welded, this channel member being preliminarily welded to one section and, if desired, being welded to the other section after assembly. In either event, it will serve as a stiffening or reinforcing member for the side walls of the manifold chamber 35. The channel member 50 is inclined slightly to the horizontal, and welded or otherwise attached to its bottom surface is an arcuate strip or deflector member 51 which extends downwardly into the curved portion of the main passage 33. The curved deflector member 51, being disposed at the entrance to the manifold chamber 35, serves to divert some of the gases in a direction toward the inlet end of the burner unit, thus preventing an excessive flow of the gases in the opposite direction or toward the right, as viewed in Figs. 2 and 5. The channel member 50 also functions to divert the flow of gases in a horizontal direction, thus preventing a greater flow of gases from that portion of the passage 37 immediately above the curved portion of the delivery passage 33 than from the end portions of the passage 37.

A sheet metal bracket 53 is welded to the side of one of the sections 20 or 21 in any desired location and a clamping member 54, secured to the bracket by screws 55, is used for the purpose of holding a pilot structure, indicated generally by the reference character 57.

The inner and outer surfaces of the burner unit, as thus far described, are preferably provided with a protective porcelain enamel coating to prevent rust and corrosion. The coating of the surfaces may be accomplished by dipping the unit into a supply of enamel and thereafter placing the burner unit in an oven to cause the enamel to be baked thereon to provide a hard,

glossy finish. The channel member 50, in addition to serving as a baffle, also functions to reinforce the sides of the burner unit to prevent warpage thereof during the baking of the enamel. If preferred, the parts of the burner unit may be constructed from stainless steel or other rust and corrosion resisting material.

Disposed within the longitudinal discharge passage 37 is an interstitial burner element 60 for dividing said passage into a plurality of separate openings or orifices. The present drawings illustrate several types of burner elements adapted particularly for use in a gas burner unit of the type herein disclosed. Referring to Figs. 1, 6, and 7 of the drawings, one type of burner element 60 may comprise a plurality of sheet metal strips or grid members 61 which are corrugated transversely throughout their length. The corrugated grid members 61, which are preferably made from stainless steel or other corrosion- and rust-resistant material, are separated by stainless steel separator members 62 interposed therebetween. The corrugated members 61 and the separator members 62 are made into a unitary structure, either by being wired together or by being welded together at intervals. The separator strips 62 cooperate with the corrugations of the grid members 61 in providing a plurality of vertical orifices or passages 63 through which the gases are adapted to flow.

The burner element 60, comprising the corrugated grid members 61 and separator members 62, may be supported within the outlet passage 37 in any suitable manner and in Figs. 6 and 7 is shown a novel means for connecting it in place. The supporting means consists of substantially U-shaped clips or supporting members 65, each having a horizontal base portion 66 and upstanding sides 67, the sides 67 being provided with slots 68 at their upper ends. The upper ends of the sides 67 are bent outwardly to provide lateral flanges 69, whereby the slots 68 face outwardly. The sides 67 of the supporting members are of a width substantially equal to the width of the grooves 31 in the lips 28 of the burner sections 20 and 21 to adapt them to be positioned therein with their lateral flanges 69 overlying the upper edges of the lips. Preferably, the sides 67 are spot welded to the lips 28 within the grooves 31 before enameling. A retainer strip 70 of sheet metal is placed across the top of the flanges 69 and its ends bent down through the slots 68 and folded laterally against the under side of the flanges to retain the burner element 60 in place. The present invention thus provides a particularly simple and efficient means for supporting the burner element 60, and it will be apparent that the burner element may be readily removed from the burner unit by simply releasing the retainer members 70 and lifting the element bodily out of the passage 37. The element 60 then may be cleaned and re-assembled in place in the manner above explained. Also, such a construction permits initial insertion of a burner element 60 best adapted to the burning of the available gas.

Figs. 8 and 9 illustrate a burner element supporting means which is of slightly modified construction. In this alternative construction, U-shaped supporting members 72 have their sides 73 welded in place in the grooves 31 of the burner sections 20 and 21 and are adapted to support the burner element 60. After the burner element 60 is placed in the several holders 72, the upper ends of the sides 73 are folded inwardly from their dotted line position of Fig. 9 to overlie the top of the burner element, as shown at 74, to retain the element in place in the discharge passage 37.

A further modified means for supporting a burner element is shown in Figs. 10, 11, and 12 of the drawings. This supporting means comprises a substantially U-shaped supporting member 75 having a base portion 76 and upstanding sides 77. The base portion 76 and sides 77 are extended laterally adjacent their point of joinder to provide locking portions 78 adapted to underlie the lips 28 of the burner sections 20 and 21. The upper ends of the sides 77 are bent laterally outward to form shoulders 80 adapted to overlie the upper ends of the lips 28, these sides 77 extending upward above the shoulders to provide tabs 81. To assemble the supporting member 75 in place in the discharge passage 37, the member is inserted into the passage in the manner indicated in Fig. 12, that is, with the plane of its base portion 76 extending in the longitudinal plane of the opening 37. The supporting member 75 is then rotated through 90° to cause its sides 77 to move into the recesses or grooves 31 of the lips 28. During this movement, the locking portions 78 move into position beneath the lower portions of the lips 28, while the shoulders 80 move into engagement with the upper ends of the lips 28. The supporting members 75 thus are releasably secured within the mouth of the burner unit and are adapted to support the burner element 60 which is lowered into the discharge passage 37. After the burner element 60 has been placed on the base portion 76 of the supporting members 75, the tabs 81 are folded down, as shown by full lines in Fig. 11, to overlie the element to retain the same in place.

Figs. 13 and 14 show a burner element 83 which is permanently mounted within the discharge passage 37 of the burner unit. The burner element 83 consists of a channel member having a base portion 84 and upstanding sides 85. The sides 85 are suitably crimped to provide vertical corrugations 86 which may be welded or otherwise secured to the inner surfaces of the lips 28. Through this construction, spaced vertical orifices or jets 87 are provided through which the combustible gas mixture may flow to be burned above the mouth of the gas burner.

In Figs. 15 and 16, a still further modified form of burner element 90 is shown. This element 90 is formed by crimping the upstanding lips 28 of the burner to provide vertical corrugations 91 and inserting a channel member 92 in the discharge passage 37, the straight sides 93 of the channel member being thereafter welded to the corrugations. The sides 93 cooperate with the corrugations 91 to provide two spaced rows of vertical orifices or jets 95 for the discharge of the combustible gas mixture, which is adapted to burn thereabove.

It will be observed from the foregoing that our invention provides a simple yet highly efficient gas burner for use in space heaters, grills, ovens, and in other gas burning equipment of domestic or industrial types. As one important feature of improvement, the gas burner unit is constructed from two mating sheet metal stampings welded together to provide a light-weight structure. The novel gas burner unit is strong and durable in use and may have its inner and outer surfaces coated to resist rust and corrosion. The invention further provides a novel form of interstitial burner element which also is light in weight and which is adapted for economical manufac-

ture from sheet metal stampings. The burner element may consist of a unitary structure adapted to be readily assembled in and removed from the gas burner unit, or may be made as an integral part of the burner unit. By providing corrugated members or grids in the burner element, a plurality of spaced orifices or jets are formed through which the combustible gas mixture may discharge to be burned in separate flames adjacent the mouth of the burner. As a further feature of improvement, the present invention provides deflector means within the manifold chamber for equalizing the distribution of gases, whereby to effect a uniform flow of the combustible mixture from the mouth of the burner.

While our improved gas burner and burner elements have been herein shown and described as embodied in several preferred forms of construction by way of example, it is to be understood that various changes may be made therein without departing from the spirit of the invention, and we, therefore, reserve the right to all such changes as properly fall within the scope of the appended claims.

We claim as our invention:

1. A gas burner comprising: a hollow burner unit having a manifold passage adapted to receive a combustible mixture, said burner unit having upstanding sheet-metal walls bounding a discharge passage extending lengthwise of and communicating with said manifold passage to receive said combustible mixture, said walls having recesses; an interstitial burner element disposed in said discharge passage and providing a plurality of orifices for conducting the combustible mixture from said manifold passage to the exterior of said burner unit; and a plurality of U-shaped supporting members disposed in said recesses and engaging said sheet-metal walls of said discharge passage and respectively providing base portions extending transversely beneath said burner element in supporting relationship, said supporting members being retained in spaced relation by said recesses.

2. A gas burner as defined in claim 1, including means for removably retaining said U-shaped supporting members in said discharge passage, and means overlying said burner element for removably retaining said element on said supporting members.

3. A gas burner as defined in claim 1, in which said U-shaped supporting members provide deformable tabs above said burner element and adapted to be bent to extend at least partially across the upper end of said burner element to retain same in said discharge passage.

4. A gas burner comprising: a hollow burner unit having a manifold passage adapted to receive a combustible mixture, said burner unit having sheet-metal walls defining a discharge passage extending lengthwise of and communicating with said manifold passage to receive said combustible mixture, said sheet metal walls providing an upper lip bounding the upper extremity of said discharge passage; a burner element of a size to fit into said discharge passage and comprising a plurality of transversely corrugated grid members and a plurality of separator members disposed between said grid members and cooperating with said corrugations to provide a plurality of orifices through which the combustible mixture is adapted to flow; and sheet metal clip means attached to said walls and extending downwardly from a position above said upper lip and along at least one side of said burner element to a position therebeneath for supporting said burner element in said discharge passage, said clip means having portions overlying said burner element to retain the same in said discharge passage.

5. A gas burner, comprising: a hollow sheet metal burner unit having a longitudinal manifold passage adapted to receive a combustible mixture, said burner unit also having a discharge passage bounded by upstanding sheet metal walls having longitudinally spaced recesses, said discharge passage communicating with said manifold passage throughout the length thereof; a plurality of substantially U-shaped, sheet metal members spaced along said discharge passage, each of said members having a base portion and upstanding side walls, said base portion extending at least partially across said discharge passage, said side walls being disposed in and retained in spaced relation by said recesses; and an interstitial burner element removably supported by said base portions and extending lengthwise within said discharge passage and co-operating with said sheet metal walls in defining a plurality of orifices for conducting the combustible mixture from said manifold passage to the exterior of said burner unit.

6. A gas burner, comprising: a hollow sheet metal burner unit having a longitudinal manifold passage adapted to receive a combustible mixture, said burner unit also having a discharge passage bounded by upstanding sheet metal walls having longitudinally spaced recesses, said discharge passage communicating with said manifold passage throughout the length thereof; a plurality of substantially U-shaped, sheet metal clip members spaced along said discharge passage, each of said members having a base portion and upstanding side walls, said base portion extending at least partially across said discharge passage, said side walls being secured within and retained in spaced relation by said recesses; and an interstitial burner element removably supported by said base portions and extending lengthwise within said discharge passage and co-operating with said sheet metal walls in defining a plurality of orifices for conducting the combustible mixture from said manifold passage to the exterior of said burner unit.

7. A gas burner as defined in claim 6, including extensions of said side walls of said clip members extending at least partially across the top of said burner element for removably retaining the same in position upon said base portions.

8. A gas burner as defined in claim 6, including means for removably retaining said interstitial burner element in said discharge passage upon said base portions, said means comprising bent portions of said side walls of said clip members overlying said burner element.

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