This invention relates to burners of the type used in enamel baking, metal melting, textile processing, paper drying, ceramic glazing, food processing and the like and particularly where fast and economical heat penetration is desired, and in particular the invention includes a burner having a central supply chamber in combination with a surrounding refractory wherein a continuous web of a gaseous mixture is ejected toward the refractory and ignites to form a continuous flame as the gases contact the refractory.

The high degree of efficiency obtained by combining a refractory such as a ceramic with a burner has long been appreciated as the refractory provides means for radiating the infra-red rays. The term infra-red rays means radiant vibrations near the red end of the light spectrum at a frequency invisible to the eye. These electromagnetic infra-red rays in themselves contain no heat and develop heat only when they are absorbed by some object. Thus heat transferred by infra-red rays from the source to the object to be heated is absorbed substantially 100%.

The purpose of this invention is therefore, to efficiently combine a refractory with a burner, wherein means is provided at the point of ignition or combustion for radiating the infra-red rays of burning volatile gases.

To further increase the efficiency of burners using a refractory it has been found desirable to provide means for holding the gases of combustion in combination with an incandescent radiating body, and to accomplish this end the invention includes flutes in the surface of the refractory and with the surface thereof shaped to increase the area of radiant incandescent surface.

To further facilitate burning gases in combination with refractory elements it has been found necessary, not only to groove or flute the contacting surface, but also slope the surface of the refractory downward from the central chamber from which the gases are being ejected thereby providing a hollow in which the gases are retained until complete absorption and combustion takes place.

Because of the intense heat of burners of this type it has also been found necessary to replace the usual sheet metal or structural framework around the refractory which forms the supporting elements, with substantially heavy cast iron or steel elements; and for extremely high temperatures silicon-carbide supporting plates are used.

In order to obtain the maximum of efficiency of burning gases in combination with refractory material it is essential to provide equalized distribution in the burner tube so that precisely the same amounts of the gases are being ejected at all points along the burner elements.

With these and other ends in view the invention contemplates a burner comprising a plurality of comparatively short gas ejecting units with each unit fed through an individual supply tube, with constricted or venturi sections in the units, and with the supply tubes communicating with a relatively large header.

The object of this invention is, therefore, to improve the construction and arrangement of the parts of burners used for high temperatures and particularly in combination with refractory elements wherein burning is evenly distributed along the burner and the life of the burner is extended.

Another object of the invention is to form the surface of refractory elements used in combination with burners so that the gases are held in contact with the refractory and do not just rush over the surface thereof.

Another object of the invention is to provide means for evenly distributing the burning gases of elongated burners.

A further object of the invention is to provide means for increasing the area of incandescent surface of refractory elements used in combination with burners wherein the maximum quantity of radiant heat is emitted.

A still further object of the invention is to provide a comparatively short burner unit which in itself is complete wherein a plurality of units may be used end to end to form a continuous burner with even distribution throughout the length thereof.

With these and other objects in view the invention embodies a burner unit having a cast iron base, with cast iron supporting side plates, a centrally disposed longitudinally extending gas supply chamber, refractory elements with fluted concave exposed surfaces between the supply chamber and side plates, and a continuous header with individual supply connections to the units.

Other features and advantages of the invention will appear from the following description taken in connection with the drawings, wherein:

Figure 1 is a view showing a section through one of the burner units and header, the section
being taken adjacent one end of a continuous burner.

Figure 2 is a view illustrating an end elevation of one of the burner units with parts broken away and parts in section.

Figure 3 is a section through one of the refractory elements on line 3—3 of Figure 2.

Figure 4 is a plan view of a base element with part of a burner head shown thereon in which the burner head is broken away and shown in section.

Figure 5 is a view showing a side elevation of a burner head with a base in combination therewith with parts shown in section.

Figure 6 is a view showing a front elevation of a burner end unit with a side plate shown in section at one side.

Figure 7 is a top plan view of the burner end assembly shown in Figure 6.

Figure 8 is an end view of the burner end assembly shown in Figure 6 with the side plate omitted.

Figure 9 is a cross section through the burner end on line 5—5 of Figure 6.

Referring now to the drawings wherein like reference characters indicate corresponding parts the radiant infra-ray gas burner of this invention includes a base 15, side plates 11 and 12, end plates 16, refractory elements 14 and a header 15.

The base 16 is formed with an upper plate 16 having recesses 17 at the sides and diagonally extending lugs 18 at the corners. In the center of the base is an opening 19 having a surrounding flange 20 and a hub 21 of the burner header 15 extends downward through the opening to provide means for connecting the header to a supply manifold 22 through a connection 23 as shown in Figure 1.

A header 24 of a modified design is shown in Figure 2 wherein inwardly extending webs 25 and 26 are provided on the inner surfaces of the sides so that a constricted venturi area 27 is formed intermediate of the height of the header to insure even distribution of the gases throughout the header. In this design a connection 28 is thread into the base 29 of the header as shown and the connections 28 connect the burner units to a manifold similar to the manifold 22 shown in Figure 1.

The upper surface of the header is provided with rows of orifices 30 adjacent the edges thereof and baffle plates 31 are positioned above the headers and spaced therefrom by spacers 32, as shown in Figures 1 and 2. The baffles 31 and spacers 32 are held to the headers by screws 33, and the ends of the spacers are provided with wings 34 as shown in Figure 4 to close the areas at the ends of the headers.

The associated surfaces of the refractory elements are formed with substantially V-shaped flutes 35 which extend backward into the refractory material having arcuate formations increasing the area of the contacting incandescent surfaces of the elements to obtain maximum radiating surface areas.

The refractory elements are held with clamping action to the base by side plates 11 and 12 and the side plates are held by screws 36 which extend into the sides of the base.

The burners may be formed of one, or any number of units, and the ends may be closed by sections 13 as shown in Figures 1, 6, and 5. The end sections 13 are provided with pockets 37 with overhanging flanges 38 at the upper ends and base elements 39 adjacent the lower ends. Refractory elements 40 are provided in the pockets, and for high temperature burners the ends and special side plates 41 may be made of silicon carbide. The ends 13 are attached to the base elements 10 by screws 42 as shown in Figure 9, holding the refractory elements therein by clamping action.

The improved gas burner of this invention, therefore, includes a continuous burner formed of comparatively short burner units with each unit fed through a burner header from a supply manifold, and the individual units include refractory elements the exposed surfaces of which are shaped to provide the greatest possible incandescent radiating areas, and the refractory elements are supported in relatively heavy cast elements. The burner units are also provided with constricted internal areas to further facilitate equalized distribution of the gases for burning.

The radiant incandescent burner and the associated parts of this invention are illustrated in the preferred forms, however it will be understood that modifications may be made in the parts without departing from the spirit of the invention.

What is claimed is:

1. In a radiant gas burner, the combination, which comprises, a longitudinally extending centrally disposed gas ejecting header with a hollow chamber on the interior thereof and having rows of orifices in the upper surface, adjacent the edges thereof, and communicating with the chamber, a baffle plate spaced above the upper surface of the header, mounted thereon and extending outward from said orifices, the edges of said baffle plate forming, with the header, laterally directed slots communicating with said orifices, elongated refractory elements with concave surfaces positioned on opposite sides of the header and spaced from said baffle plate, the lower edges of said concave surfaces being immediately below said slots whereby the flame from said slots is directed against said surfaces and provides incandescent radiating bodies for accelerating combustion of the gases, a cast iron base on which the said refractory elements and header are positioned, cast side plates attached to the base holding the said refractory elements, and a supply manifold positioned below the burner with connections through the base to the header.

2. A gas burner as described in claim 1, wherein the header is rectangular-shaped in cross section having side walls, a base, and an upper surface, and wherein the inner surfaces of the side walls extend inwardly providing a centrally disposed longitudinally extended constricted area midway of the height of the header.

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