Feb. 20, 1951 C. H. BUTZ 2,542,750

RADIANT BOWL GAS BURNER

Filed March 9, 1948 2 Sheets-Sheet 1

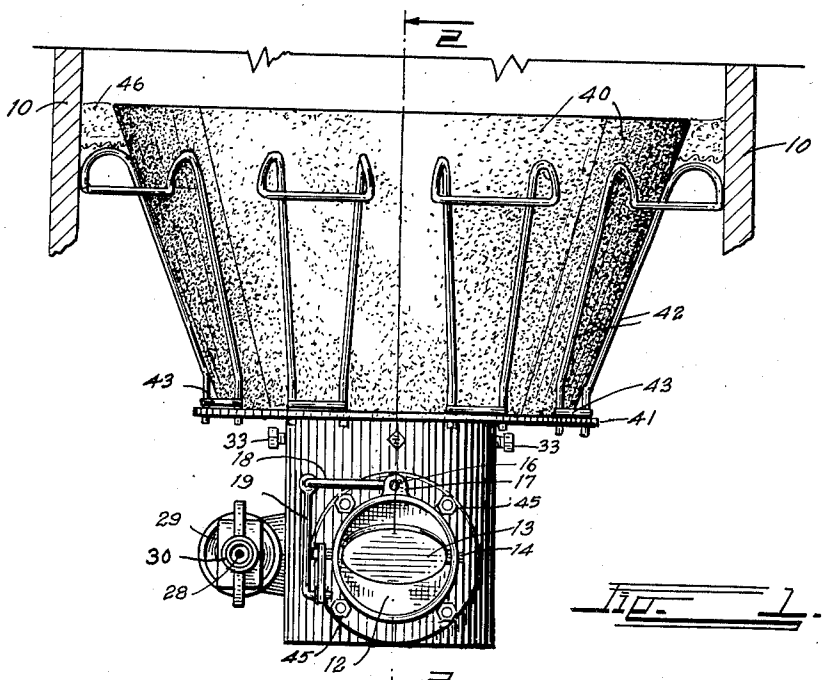


Fig. 1.

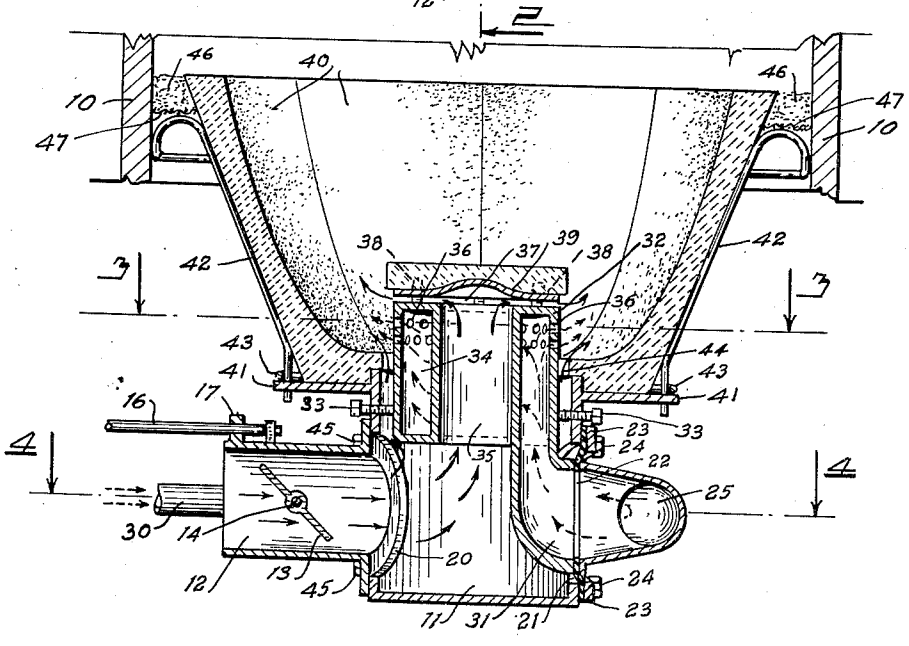


Fig. 2.

INVENTOR.
CHARLES H. BUTZ
BY
ATTORNEY.

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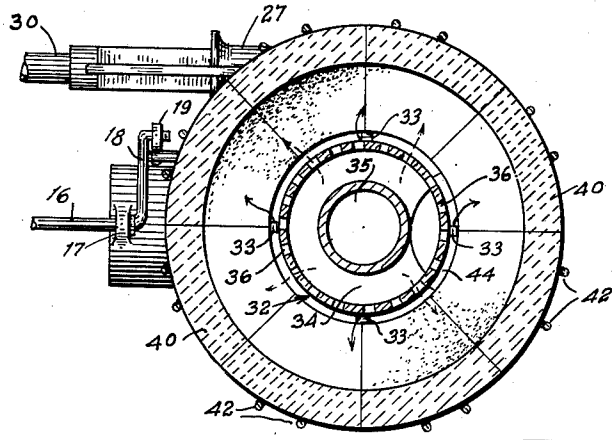


Fig. 3.

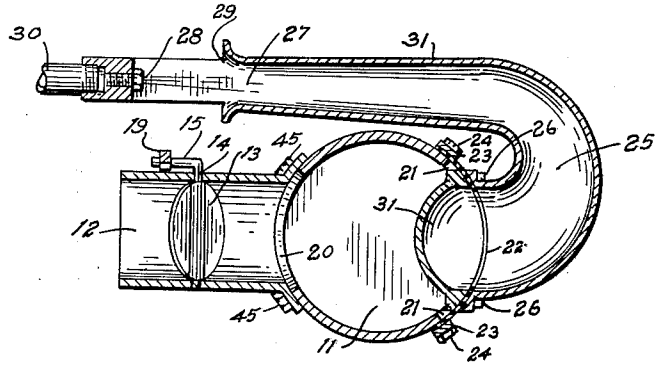


Fig. 4.

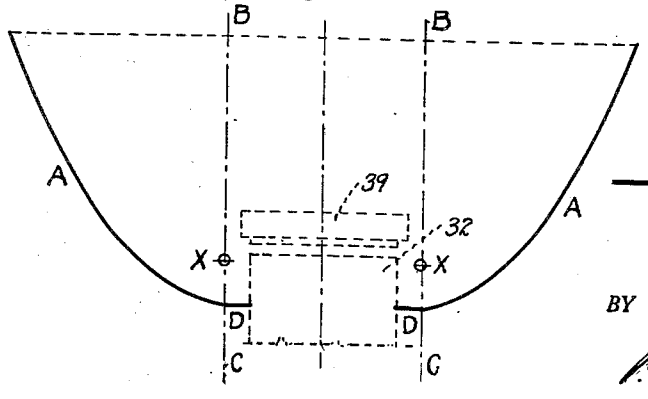


Fig. 5.

INVENTOR.
CHARLES H BUTZ
BY
ATTORNEY

Patented Feb. 20, 1951

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2,542,750

RADIANT BOWL GAS BURNER

Charles H. Butz, Denver, Colo.

Application March 9, 1948, Serial No. 13,762

2 Claims. (Cl. 158—99)

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This invention relates to a gas burner, and has for its principal object the provision of a highly efficient gas burner unit which can be quickly and easily installed in present heating plants.

Another object of the invention is to provide a reflecting, flame-shaping wall or bowl for the burner which will concentrate the heat in the fire box areas where the greatest heat is desired and reduce wastage of heat in the ash pit and other areas where the heat is not required.

A further object is to produce a gas burner which will form a continuous, parabolic-shaped, bowl-like sheet of flame.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawings:

Fig. 1 is a side view of the improved burner, illustrating its position in a fire box;

Fig. 2 is a vertical cross-section therethrough, taken on the line 2—2, Fig. 1;

Fig. 3 is a horizontal cross-section, taken on the line 3—3, Fig. 2; and

Fig. 4 is a similar cross-section, taken on the line 4—4, Fig. 2; and

Fig. 5 is a diagram illustrating the contour of the surface of a refractory flame bowl employed in the improved burner.

In the drawings, the walls of a fire box of any heating plant are indicated at 10. The improved burner comprises a cylindrical air chamber 11 having a closed bottom and an open top. A secondary air intake thimble 12 is secured over an opening 20 in the side of the air chamber 11 by means of suitable cap screws 45.

The air flow through the thimble 12 is controlled by means of a butterfly damper 13 mounted on a horizontal damper shaft 14 terminating in an operating arm 15 on the exterior of the thimble 12. An operating rod 16 extends to the exterior of the heating plant and is rotatably mounted in an ear 17 on the thimble 12. The inner extremity of the operating rod is bent to form a crank arm 18, from which a connecting link 19 depends to the operating arm 15 so that the position of the damper may be controlled from the exterior of the plant.

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A second opening 21 is formed in the opposite side of the air chamber 11, and a flexible annular plate 22 is secured over this opening by means of a clamping ring 23 and suitable screws 24.

A primary mixing chamber 25 is clamped against the outside of the flexible plate 22 by means of suitable cap screws 26. The primary chamber 25 is hook-shaped and extends from a circular, relatively small intake extremity 27 to an enlarged discharge extremity at the plate 22.

The intake extremity of the primary chamber 25 is flared outwardly and carries an open yoke 29 which supports a gas jet nozzle 28 in axial alignment with the flared extremity. A gas pipe 30 feeds gas to the jet nozzle 28.

A hollow fuel-receiving arm 31 is clamped against the opposite side of the annular plate 22 by means of the cap screws 26. The arm 31 supports a hollow distributing head 32 which projects above the open extremity of the air chamber 11 in spaced relation to the walls of the latter.

The distributing head is centered and held in spaced relation with the wall of the air chamber 11 by means of set screws 33 which are threaded through the wall of the air chamber 11 into contact with the outer wall of the head 32. The flexible plate 22 allows free movement of the head 32 for centering and adjusting purposes.

The distributing head 32 is formed with an annular fuel chamber 34 surrounding a central air passage 35. A plurality of flame openings 36 extend through the outer wall of the fuel chamber 34 around its entire upper periphery.

An air-spreading cap 37 is supported above and in close relation to the head 32 upon suitable supporting pins 38. The cap 37 is preferably formed with a fire clay top portion having a metal lining plate 39 on its bottom. The plate 39 is bulged upwardly over the air chamber 35 so as to form an annular, wedge-shaped passage to direct a flat, disc-like layer of secondary air outwardly around the entire head 32 above the flame openings 36 therein.

A horizontal supporting flange is formed integrally with the air chamber 11 and extends outwardly around its top to support a refractory bowl consisting of a plurality of fire clay segment blocks 40. The segment blocks 40 are contoured so that, when assembled in a complete bowl, they will form a conical outer surface and an annular parabolic inner surface, which will be described more in detail in the following description.

The blocks 40 are supported on the flange 41 by means of wire bracket members 42. Each bracket member consists of a single length of rod bent in a U shape, with its two extremities extending through receiving openings in the flange 41. The upper portion of the rod is hooked downwardly to act as a spacing member to space the segment blocks 40 in proper uniform relation with the fire box walls 10. A cross bar 43 connects the ends of each rod 42 and rests on the flange 41. The space between the fire box wall 10 and the blocks 40 may be filled with fire clay 46 resting on a supporting screen 47.

The lower and inner edges of the blocks 40 are notched to fit against the upper edge of the air chamber 11 so that the blocks will be held spaced away from the head 32 to provide an annular air passage 44 completely around the distributing head 32.

In operation, gas enters through the jet 28 and draws primary air into the mixing chamber 25, where it is intimately mixed with the gas, due to the swirling, hook-shaped contour of the chamber. This well-mixed fuel enters the annular fuel chamber 34 and discharges through the flame openings 36 toward the inner wall of the segment brick bowl 40, where it forms a sheet-like flame lining in the bowl.

The discharging, parabolically-shaped flame is enveloped within an outer layer of air discharging through the annular air passage 44 and an inner layer of air discharging between the cap 37 and the head 32, which provides sufficient oxygen for perfect combustion over the entire inner surface of the refractory bowl.

Observation of the flame shows a continuous flame layer over the entire inner surface of the bowl, concealing the latter at all points and having a bowl-like, parabolic contour, due to the shape of the bowl.

It is desired to call particular attention to the contour of the inner surface of the segment blocks 40. This contour is diagrammatically illustrated in Figs. 5 and 6. If the surface of the bowl be cut on a radial line at any point, this surface will present a parabola having a focal point X and a directrix, as indicated by the line B—C. All of the directrix lines B—C lie in an imaginary cylinder, as indicated at B. The cylinder surrounds the head 32 and has a larger diameter than the head so as to place the focal points X, which also lie in the imaginary cylinder, in the flames discharging from the flame openings 36. The complete bowl, therefore, is not a paraboloid, but its interior surface is parabolic about the annular focal point X, and any section cut through the inner wall on a radial line will present one-half of a parabola, the other half being spaced therefrom across the diameter a distance equal to the diameter of the annular, cylindrical plane of the directrix lines B—C. Therefore, a given point in the flame will be at the focus point of a line position of the parabola of the bowl surface. It might be termed a paraboloid having an annular focus.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A gas burner comprising: a circular fuel distributing head having flame openings around its periphery and a fire clay bowl concentrically surrounding said head, the inner surface of said bowl being so contoured that any section cut through said surface on any plane radial to the axis of said head will present a parabolic curve having a focal point between said curve and said head.

2. A gas burner comprising: a circular fuel distributing head having flame openings around its periphery and a fire clay bowl concentrically surrounding said head, the inner surface of said bowl being defined by an infinite number of parabolic curves lying in planes radial to the axis of said head, the axes of said curves lying in the circumference of a co-axial circle surrounding said head, and the infinite directrix lines of said infinite number of parabolic curves defining a cylinder which is co-axial with the axis of said head.

CHARLES H. BUTZ.

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