Oct. 14, 1958 F. PRIM 2,855,919

HEATING UNITS

Filed Jan. 25, 1954 2 Sheets-Sheet 1

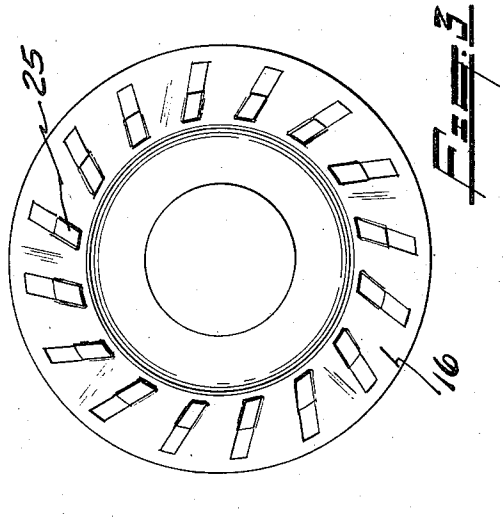


Fig. 3

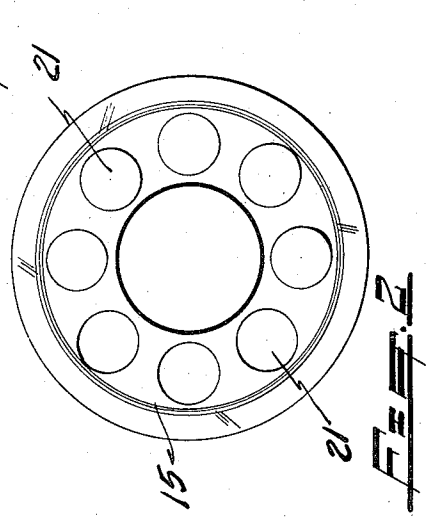


Fig. 2

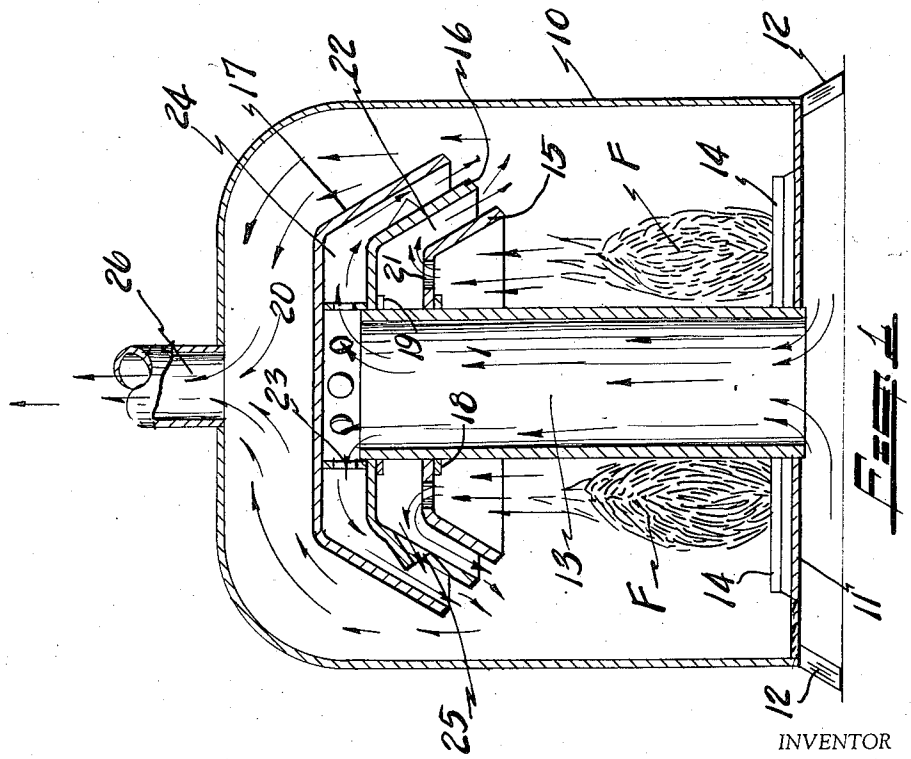


Fig. 1

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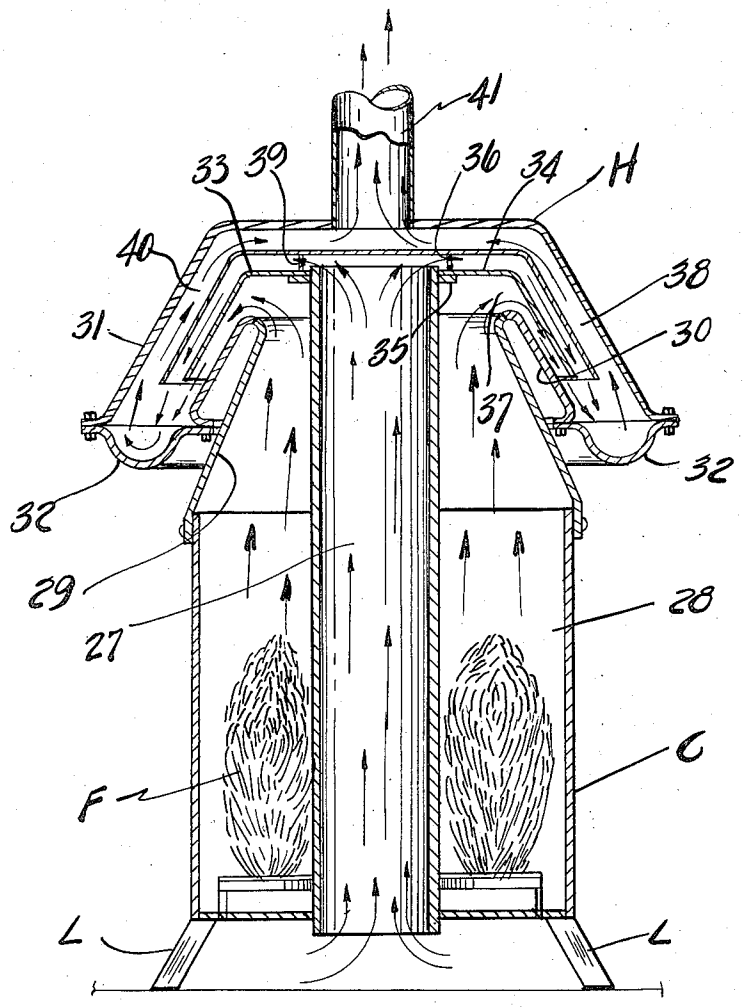


FIG. 4

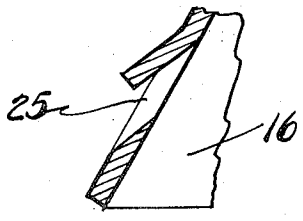


FIG. 5

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HEATING UNITS

Floyd Prim, Saginaw, Mich.

Application January 25, 1954, Serial No. 405,851

9 Claims. (Cl. 126—85)

This invention relates to heating units and more particularly to a radiant type heating unit for heating the medium surrounding the unit.

One of the prime objects of my invention is to provide a heating unit of increased efficiency in which virtually a complete fuel combustion is assured at all rates of fuel consumption, the unit being specifically designed to burn unconsumed gas and solid combustibles which escape up the stack or chimney of conventional heating units.

A further object of the invention is to design a heating unit from which an increased amount of heat is obtained at various rates of fuel consumption, thus making possible a considerable reduction in the present cost of operating heating units at given capacities.

Another object of the invention is to provide a heating unit which burns virtually all carbon monoxide and ash which escapes to the stack of conventional heating units and thereby eliminates smoke and soot problems.

A further object of the invention is to design a heating unit wherein fresh air from outside the unit is introduced by draft inspirating into the unburned products of a primary combustion to insure their complete secondary combustion.

Another object of the invention is to design a unit of the type described wherein the flame is maintained in contact with the wall of the combustion chamber so that carbon resulting from an incomplete primary combustion at extreme rates of fuel consumption will not be deposited thereon in the form of soot.

A further object of the invention is to design a heating unit of the type described wherein the air supplied to support secondary combustion is pre-heated as it passes to the combustion chamber and expands so that a very intimate, volatile mixture of the air and unburned combustibles remaining after primary combustion is achieved which burns with an intense and hot flame.

A further object of the invention is to design a unit of this type which is assured of a positive circulation of fresh air for secondary combustion and requires no fans to supply a sufficient quantity of air to the device.

Another object of the invention is to design a heating unit of durable and practical construction which can be simply and economically manufactured and assembled and which includes no moving parts which must be occasionally serviced or repaired.

With the above and other objects in view, the present invention consists in the combination and arrangement of parts, hereinafter more fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportion, and minor details of construction, without departing from the spirit, or sacrificing any of the advantages of the invention.

In the drawings:

Fig. 1 is a sectional, elevational view of my heating unit, the arrows indicating the flow of unburned gases and the pre-heated air.

Fig. 2 is a top plan view of the baffle which is employed directly above the fuel burners in my novel device.

Fig. 3 is a top plan view of the baffle which is employed immediately above the baffle illustrated in Fig. 2.

Fig. 4 is a sectional, elevational view of a modified embodiment of my invention, the arrows indicating the flow of the gases and pre-heated fresh air.

Fig. 5 is an enlarged, fragmentary sectional view through one of the baffles.

Referring now more particularly to the accompanying drawings wherein I have shown the preferred embodiments of my invention, a letter 10 represents the bell-shaped casing of my radiant type heating unit which is preferably formed of welded, stainless steel material, but which can, of course, be cast or of any other desired construction. If the unit is to be employed as a stove or unit space heater, obviously, it is complete in the form illustrated; however, if it is to be used as a furnace in combination with a duct system, an outer casing (not shown) would be provided concentrically with the casing 10, and spaced therefrom to define an air passage therebetween in the conventional manner.

Extending centrally through the bottom or floor 11 of the casing 10 which is supported on legs 12, is a vertically disposed, cylindrical air intake pipe 13 open at its lower end to admit air from a room. An annular fuel gas burner 14, supported on the floor 11, surrounds the lower end of the pipe 13 and is supplied with fuel at a controlled rate by suitable means (not shown). Openings in the floor 11 supply the air for primary combustion at the burner 14.

Mounted on the upper end of the pipe 13 are superimposed, vertically spaced-apart, conical-shaped baffle members 15, 16, and 17 as shown, the members 15 and 16 being supported by spacer rings 18 and 19 respectively, and the member 17 by an upright spacer ring 20 supported on the member 16.

Circumferentially spaced openings 21 are provided in the baffle member 15 which is mounted directly over the burner 14 and permit unburned combustibles, not consumed in the burner flame F, to proceed into the annular passage 22 between the members 15 and 16 which direct the major portion of the unburned combustibles downwardly as shown. Fresh air inspirated into the pipe 13 proceeds through circumferentially spaced openings 23 in the ring 20 into the passage 24 between the baffle members 16 and 17 which directs its flow downwardly and outwardly as shown to a point adjacent the mouth of the passage 22 where the pre-heated air is mixed with these unburned products of incomplete combustion. This air, of course, is pre-heated as it passes through the pipe 13 and circumferentially spaced openings 25 in the downwardly and outwardly extending portion of the baffle 16 permit the entrance of some of the combustibles into the air prior to its departure from the passage 24. The mixture of the pre-heated air and unburned combustible gases and carbon particles permits a complete combustion of the latter in approximately that portion of the casing in which their mixture occurs. The resulting flue gas proceeds upwardly between the baffle 17 and upper wall of the casing 10 into a stack 26 which leads outwardly to atmosphere.

The operation of the unit will be readily understood from the foregoing description and it will be apparent that a complete combustion is assured at high rates of fuel consumption when a high heat output is desired and low rates of fuel consumption when the unit is idling as well as during periods of more normal operation. The air passing through the pipe 13 into the chamber 24 is pre-heated and expands so that the resulting mixture of air and the gaseous and solid fuel combustibles in the flue gas is very intimate and of highly volatile character.

Thus, the mixture burns with a very hot flame at the mouth of the annular passages 22 and 24 to provide heat which is lost in conventional units.

In Fig. 4 I have shown a modified embodiment of invention in which a casing C is supported on legs L and is provided with an air intake pipe 27 surrounded by a burner 14 as in the previous embodiment. The casing C includes a lower cylindrical portion 28 with a conical-shaped portion 29 riveted or otherwise securely fixed thereto. Welded to the portion 29 is a hood H including an inner section 30 leading reversely therefrom and spaced therefrom as shown, an outer conical shaped section 31 and a dished or trough-shaped bottom section 32 bolted to the sections 30 and 31 as shown.

The upper end of the pipe 27 extends above the portion 29 into the hood H, and supports a pair of conical-shaped baffle members 33 and 34, the member 33 being supported on the collar 35 and the member 34 on the spacer ring 36. The products remaining from the primary combustion in the main combustion chamber defined by the portions 28 and 29 of the casing proceed into the annular passageway 37 between the inner section 30 of the hood and the baffle 33. Air inspirated up the pipe 27 passes into the passageway 38 between the baffles 33 and 34 through circumferentially spaced openings 39 in the spacer ring 36. The secondary combustion occurs at the mouth of the annular passageways 37 and 38 in the section 32 of the hood which forms a secondary combustion chamber. The products of this secondary combustion proceed into the passageway 40 between the baffle member 34 and outer section 31 of the hood H to the flue stack 41 which leads vertically from the top of the hood H to atmosphere. The air, of course, is pre-heated as in the previous embodiment and expands so that it intimately mixes with the combustibles in the primary flue gas and forms a highly combustible mixture.

It will thus be apparent that I have perfected a very practical heating unit which is very economical to operate and will find widespread applications. It is to be understood that various equivalent changes may be made in the various elements of the device without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. In a heating unit, a casing defining a combustion chamber, a fuel burner therein issuing flame therefrom and directing flame in a predetermined direction, flue means leading out of said casing, a deflector shield a spaced distance from said burner between said burner and flue means extending laterally outwardly relative to the path of said flame beyond said burner to a point short of the wall of the casing for diverting the path of the unburned products of combustion from said fuel burner laterally outwardly, and means for carrying fresh air from outside said casing to the side of said shield remote from said burner and to the outer perimetral edge of the shield to support a secondary combustion and burn unburned products of combustion from said fuel burner intimately mixed with the fresh air at the periphery of said shield between said shield and casing.

2. In a heating unit, a casing defining a combustion chamber, a fuel burner therein, flue means leading out of said casing, a deflector shield a spaced distance from said burner between said burner and flue means extending laterally outwardly and back toward said burner for diverting the unburned gaseous products of combustion of said burner outwardly and back toward said burner, the edge of said shield terminating a spaced distance from the wall of the casing laterally outward of the burner flame to define a passage therebetween and means for channeling fresh air from outside said casing to the side of the shield remote from the burner and to the outer perimetral edge of the shield to support the combustion of the unburned combustibles therein in said passage.

3. In a heating unit, a casing defining a combustion chamber, a ring-shaped fuel burner in the lower end thereof, flue means leading out of the opposite end of said casing, a laterally disposed deflector shield supported in said casing between said burner and flue means a spaced distance above said burner and shaped to deflect flue gases rising from said burner toward said flue means laterally outwardly, said shield extending outwardly beyond said burner and terminating short of the side of the casing to define a passage between the shield and casing, an air inlet pipe extending from outside said casing through said burner toward the upper end of the casing for inspirating fresh air into said casing, said tube terminating above said shield and having means incorporated therewith delivering pre-heated expanded air to the outer perimetral edge of the shield to support the burning of combustibles intimately mixed with warm fresh air therein.

4. In a heating unit, a casing, burner means therein, a flue leading out of the upper end thereof, a laterally extending baffle supported in said casing between said burner and flue, said baffle having circumferentially spaced openings therein above said burner means leading upwardly through said baffle, a second substantially conical-shaped laterally extending baffle between said first baffle and flue and spaced from said first baffle to define a passage therebetween, both baffles extending laterally outwardly relative to said burner and the direction of the flame and having their edges spaced from the wall of the casing to define a passage between their edges and the wall of the casing said second baffle directing the gaseous products of combustion flowing through said openings outwardly and back toward said burner to the edge of said second baffle, and means for channeling fresh air from outside said casing to the side of said second baffle remote from the burner to the combustion area at said passages.

5. The combination defined in claim 4 in which said burner means is ring-shaped and centrally disposed, and said air supply means comprises an inlet pipe leading from outside said casing through said burner means and through said baffles, and a third conical-shaped baffle supported a spaced distance above said inlet pipe and second baffle to direct pre-heated expanded air to the area surrounding the peripheral edges of said remaining baffles.

6. The combination defined in claim 5 in which openings are provided in said second baffle near the peripheral edge thereof to admit a limited volume of fuel gas to the fresh air passage between said second and third baffles.

7. In a heating unit, a casing defining a primary combustion chamber, an extension therefor including a reversely and outwardly turned portion defining a secondary combustion remote from the primary chamber outward of said burner, flue means leading out of said extension beyond the secondary combustion chamber, burner means in the primary chamber, a laterally extending conical-shaped deflector supported in said extension between the burner means and flue means, the peripheral edge thereof extending into said secondary chamber to divert flue gas from said primary chamber thereinto, and means for channeling fresh air to the side of said deflector remote from the burner to said secondary chamber to support the combustion of unburned combustibles in the flue gas.

8. In a heating unit, a casing supported above floor level and defining a primary combustion chamber, a burner supported in the lower end thereof, openings in the bottom of said casing for supplying air to said burner, an extension for the upper end of said casing leading upwardly and thence being turned reversely and outwardly to define a secondary combustion chamber remote from said burner, a centrally and vertically disposed air

supply pipe extending through the bottom of said casing and burner up into said extension, a frusto-conical shaped baffle supported in said extension below the upper end of said pipe, flue means leading out of said extension above said baffle, the peripheral edge of said baffle extending downwardly and outwardly into said secondary chamber to divert flue gas thereto, and baffle means above said pipe and first-mentioned baffle for delivering fresh preheated air to said secondary chamber to support the combustion of unburned combustibles in said flue gas.

9. In a heating unit, a casing, annular fluid burner means in the lower end thereof, a flue leading out of the upper end thereof, a frustoconical baffle supported a substantial distance above said burner for deflecting flue gases downwardly and outwardly, a central tube extending through the lower end of said casing up through said burner and baffle for delivering secondary air above said baffle, and a second frusto conical baffle supported a spaced distance

above said first mentioned baffle and forming therewith a passage for directing said secondary air to the flue gases at the peripheral edge of the first mentioned baffle to support a secondary combustion.

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