April 23, 1957 M. ROWLAND 2,789,520

FURNACE COMBUSTION CHAMBER

Filed April 13, 1954

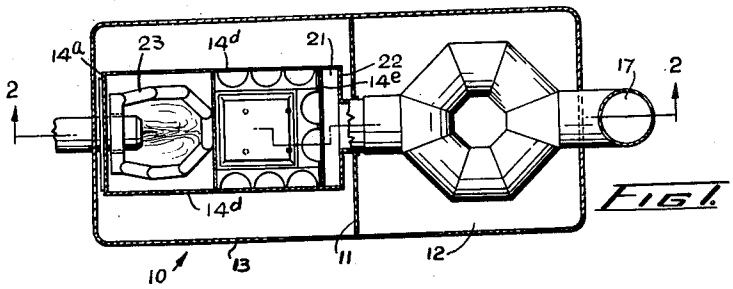


FIG 1.

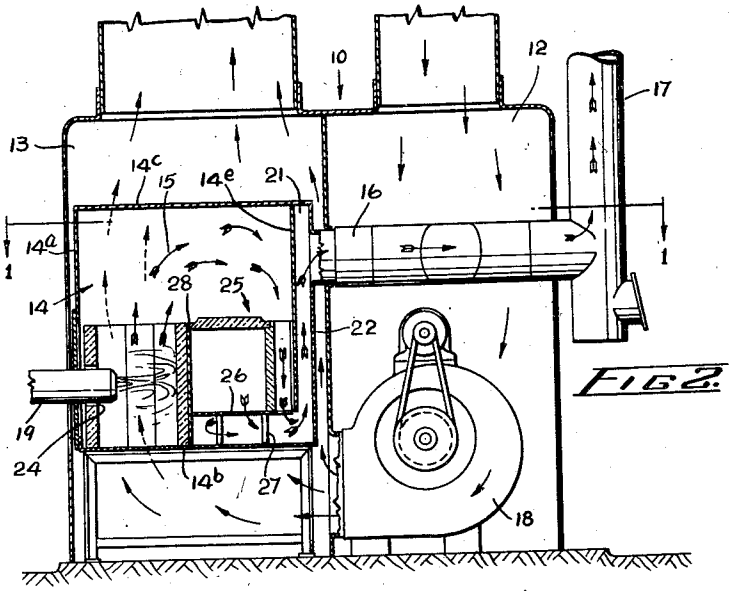


FIG 2.

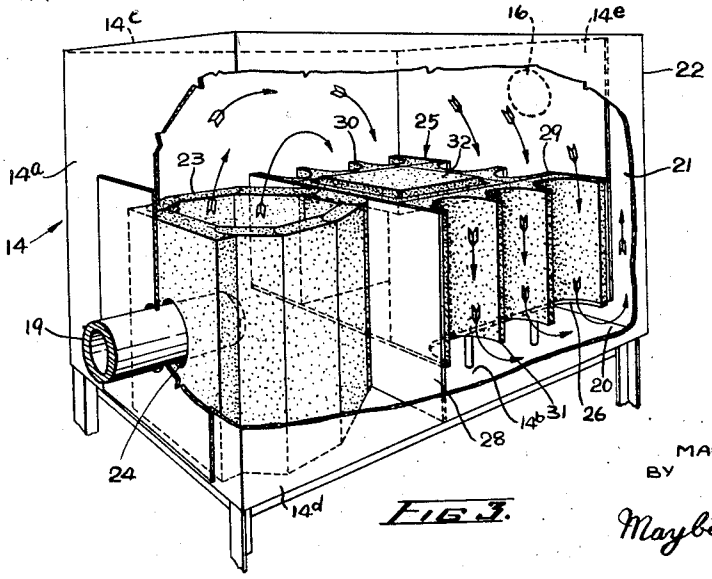


FIG 3.

INVENTOR
MAURICE ROWLAND
BY
Maybee & Legris
ATTORNEY.

United States Patent Office 2,789,520 Patented Apr. 23, 1957

2,789,520

FURNACE COMBUSTION CHAMBER

Maurice Rowland, Toronto, Ontario, Canada

Application April 13, 1954, Serial No. 422,882
Claims priority, application Canada May 12, 1953
2 Claims. (Cl. 110—97)

The invention relates to furnaces, and more particularly to a combustion chamber for furnaces of the type which are constructed or modified to burn a hydrocarbon fuel, usually discharged into the chamber by some form of spray ejector fuel nozzle type burner.

In some constructions now used, it is the usual practice to direct the discharge from the burner nozzle into the combustion chamber which usually is made of ceramic material and is built to suit the contour of that portion of the furnace in which it is placed. In other instances, the discharge from the burner nozzle is directed against a metallic plate positioned in the combustion chamber to constitute a hot target against which the burning fuel impinges.

Such constructions have not proven to be entirely satisfactory, among other reasons due to the fact that the process of combustion was not sufficiently completed prior to contact of the burning gases against the heat absorbing walls or the plate of the furnace. The fact that soot deposits are found in the outlet flue and in contact with the air jacketed or water jacketed walls shows that with the known forms of such constructions some of the more difficultly oxidizable hydrocarbon complexes in the fuel are not completely oxidized.

The primary object of the invention is to provide a combustion chamber for furnaces, which is so designed that substantially complete combustion of the hydrocarbon complexes present in the fuel takes place.

Another object of the invention is to provide a combustion chamber for furnaces, which is so constructed that it has a high heat storage capacity so that when the burner is not in operation, the furnace continues transmitting heat to the premises.

A further object of the invention is to provide a combustion chamber so constructed that the heat absorption of a given furnace is greatly increased.

A still further object of the invention is to provide a combustion chamber that is economical in manufacture, durable in use, and efficient in operation.

According to the invention a combustion chamber includes a fire pot which is located in the fore portion of the combustion chamber and is directly exposed to the jet of burning fuel ejected by the burner, and a baffle body located aft of the fire pot and is so disposed relative to the walls of the combustion chamber as to permit downdraft convection of the products of combustion before a pass out into the flue outlet.

The foregoing and still further objects and advantages of the invention will become apparent from a study of the following specification, taken in conjunction with the accompanying drawings, in which like reference characters indicate corresponding parts throughout the several views and in which:

Fig. 1 is a horizontal cross-sectional view of a typical furnace in which the invention is embodied, the said view more specifically being taken about the line 1—1 in Fig. 2;

Fig. 2 is a vertical cross-sectional view of the said furnace, taken on the line 2—2 of Fig. 1; and

Fig. 3 is a broken away perspective view of a combustion chamber constructed in accordance with the invention.

The furnace illustrated in Figs. 1 and 2 is a typical hot air furnace in which a combustion chamber according to the invention is embodied. It comprises a casing generally indicated at 10, in the interior of which is a vertical partition 11 which divides the furnace into a preheating chamber 12 and a heating chamber 13, the upper portion of which is often known as the plenum chamber. Located within the heating chamber 13 and appropriately spaced from its bottom is a shell 14 which encloses a combustion chamber 15. The shell is spaced from the walls of the heating chamber to permit circulation of the air which is being heated. Connected to the rear of the combustion chamber is an outlet passage 16 which in the embodiment illustrated is in the form of a pre-heater and which in turn is connected to a stack 17. Within the preheating chamber 12 is a blower assembly 18, which draws return air from the premises, as indicated by full arrows, the said return air scrubbing the pre-heater and then passing around and scrubbing the combustion chamber, then passing into the plenum chamber and eventually being conveyed by ducts to various rooms in the premises, in a known manner. A suitable fuel jet 19 delivers a mixture of fuel and air into the combustion chamber.

The combustion chamber 15 is defined by the shell generally indicated at 14 comprising a front wall 14*a*, a bottom wall 14*b*, a top wall 14*c*, side walls 14*d* and a rear partition wall 14*e*. The lower edge of the rear partition wall 14*e* is spaced from the bottom wall 14*b*, thus providing an outlet 20 at the bottom of the combustion chamber. To the rear of the said outlet is an outlet flue 21 formed by extensions of the previously described walls and by a rear wall 22. The outlet passage 16 registers with an opening in the wall 22.

Bearing on the bottom wall 14*b* of the combustion chamber, and located in the front half thereof is an open top fire pot 23 made of slabs of fire brick or other ceramic material, joined together in a known manner. As illustrated, the fire pot is generally ovoid in horizontal cross section. In the front of the fire pot is an aperture 24 through which passes the nozzle 19.

Located in the space between the fire pot 23 and the rear partition wall 14*e* is a baffle body generally indicated at 25. The baffle body includes a steel bottom plate 26 supported by four legs 27; thus, an open passage is provided underneath the baffle body. The front wall of the baffle body is provided by a vertically disposed steel plate 28, which extends to the bottom of the combustion chamber and from one side wall thereof to the other; this plate contacts the rear of the fire pot 23. Supported by the bottom plate is a vertically disposed ceramic rear wall 29, which is in contact with the rear wall 14*e* of the combustion chamber. Also supported by the bottom plate and extending between the plate 28 and the rear wall 29 are ceramic side walls 30 and 31. The three ceramic walls 29, 30 and 31, are cemented or otherwise secured to each other in a manner well known in the art, and together they provide a U-shaped side wall which engages the face of the baffle plate 28 to define a chamber. There is also provided a ceramic top wall 32, which bears on the vertically disposed walls and closes the chamber which they define.

The three ceramic vertically disposed walls are fluted, as clearly illustrated in the drawings, and thus the vertical portions of the baffle body engage the combustion chamber only at the portions between adjacent flutes. The flutes include ridges and recesses, and the ridges contact the opposed wall portions of the shell 14; the flutes in co-operation with the opposed walls of the shell provide passages for downdraft convection of the hot products of combus-

tion from the open top of the fire pot to the outlet flue 21.

In operation, the fuel-air mixture ejected by the nozzle 19 is burned in the fire pot 23. Its ceramic walls become very hot and the heat therefrom, mostly by radiation and convection, is transmitted to the air which circulates around the combustion chamber. The hot products of combustion move upwardly by convection in the manner indicated by the feathered arrows and then downwardly through the flues provided by the aforedescribed fluting, and then they move horizontally toward the rear along the bottom wall 14*b* of the combustion chamber and eventually through the outlet 20, upwardly in the outlet flue 21 and finally through the outlet passage 16 and the stack 17. The baffle body 25 also becomes very hot and it radiates and convects heat.

Through the aforedescribed arrangement a more complete combustion than has heretofore been possible in domestic furnaces is achieved. Furthermore, the baffle body and the fire pot store substantial quantities of heat. Domestic furnaces of the type in question operate intermittently, their operation being controlled by a thermostat which is responsive to the ambient temperature. The large amount of heat stored in the ceramic fire pot and the ceramic portions of the baffle body continue being transferred to the forced air after combustion has discontinued, in response to the action of the thermostat and thus a more "even" heating of the premises is achieved than has heretofore been possible with furnaces of this kind.

It is to be understood that the form of the invention herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of the parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

What we claim as our invention is:

1. A furnace comprising a shell which provides a combustion chamber, the shell including a bottom, a top wall, two side walls, a front wall and a rear wall, and open-top fire pot located inside and bearing on the bottom of the shell and spaced from the rear wall of the shell, means delivering a fuel-air mixture to the fire pot, the shell having an outlet in its rear wall near its bottom, a substantially vertically disposed baffle plate bearing on the bottom of the shell and extending from one side wall of the shell to the other side wall, one face of the baffle plate contacting the rear of the fire pot, and a heat storing baffle body located in the space between the baffle plate and the rear of the shell, the said baffle body comprising a bottom plate, supporting means bearing on the bottom of the shell and supporting the bottom plate in spaced relationship to the bottom of the shell, three vertically disposed side walls, the opposite ends of one side wall engaging respectively an end of the other two side walls so that the said three side walls together provide a U-shaped wall, the U-shaped wall bearing on the bottom plate and its ends that are constituted by the other ends of the said other two side walls engaging the other face of the baffle plate to define a chamber, and an upper wall in engagement with the upper portion of the baffle plate and with the upper portions of the three side walls that constitute the U-shaped wall, the said upper wall providing a closure for the last mentioned chamber, generally vertical flutes being provided in the outside face of the U-shaped wall, the U-shaped wall at portions between adjacent flutes engaging opposed walls of the shell, the flutes including ridges and recesses the ridges of the flutes contacting the opposed walls of the shell, and the flutes in co-operation with the opposed walls of the shell providing passages for downdraft convection of the hot products of combustion from the open top of the fire pot to the outlet.

2. A furnace comprising a shell which provides a combustion chamber, the shell including a bottom, a top wall, two side walls, a front wall and a rear wall, an open-top fire pot located inside and bearing on the bottom of the shell and spaced from the rear wall of the shell, means delivering a fuel-air mixture to the fire pot, the shell having an outlet in its rear wall near its bottom, and a heat storing baffle body located in the space between the fire pot and the rear wall of the shell, the said baffle body including a bottom plate, legs extending underneath the bottom plate and which support the bottom plate in spaced relationship to the bottom of the shell, a vertically disposed baffle plate extending from one side wall of the shell to the other side wall and bearing on the bottom of the shell and having a face which contacts the rear of the fire pot, the baffle plate providing a front wall of the baffle body, a vertically disposed ceramic rear wall supported by the bottom plate and which engages the rear wall of the shell, verticaly disposed ceramic side walls extending between the said front and rear walls of the baffle body and also supported by the bottom plate, and a ceramic top wall bearing on the vertically disposed walls of the baffle body and closing the chamber which they define, vertically disposed flutes being provided in the outside faces of the ceramic side and rear walls, the flutes including ridges and recesses, the ridges of the flutes contacting the opposed walls of the shell, and the flutes in co-operation with the opposed walls of the shell providing passages for the downward convection of the hot products of combustion from the open top of the fire pot to the outlet.

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