Dec. 4, 1945. P. WINGERT 2,390,483

INTERNAL CONSTRUCTION FOR STOVES AND FURNACES

Filed June 19, 1941 2 Sheets-Sheet 1

Fig. 1

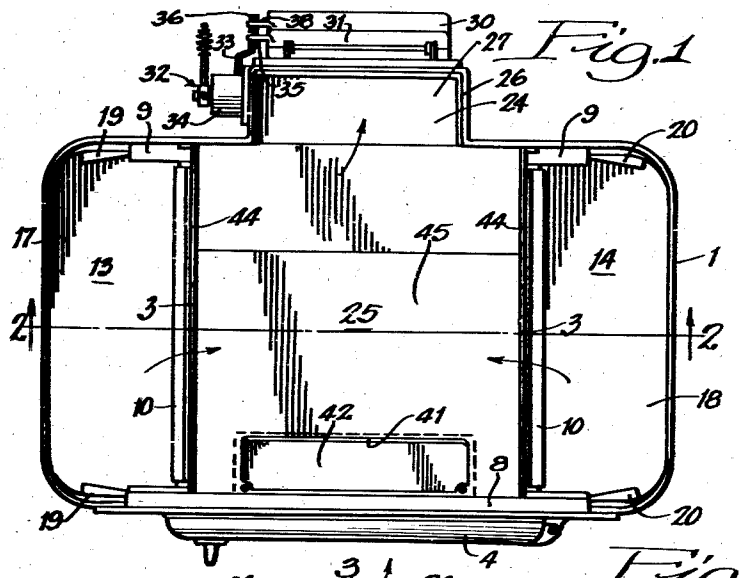
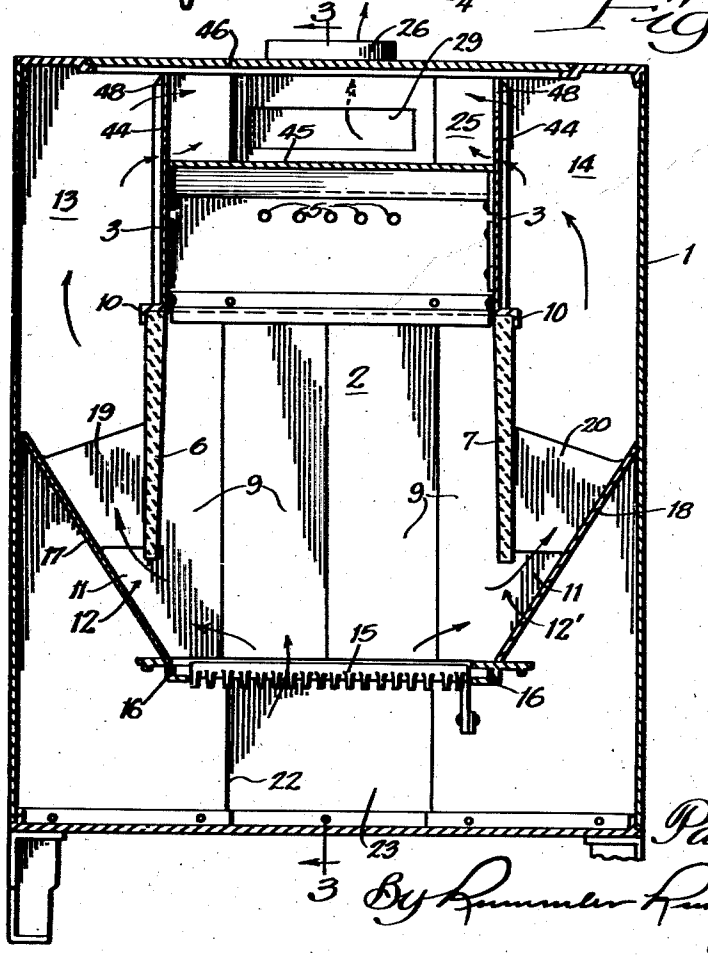


Fig. 2



Inventor:
Paul Wingert,
By Rummler Rummler & Davis
Attorneys.

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Fig. 3

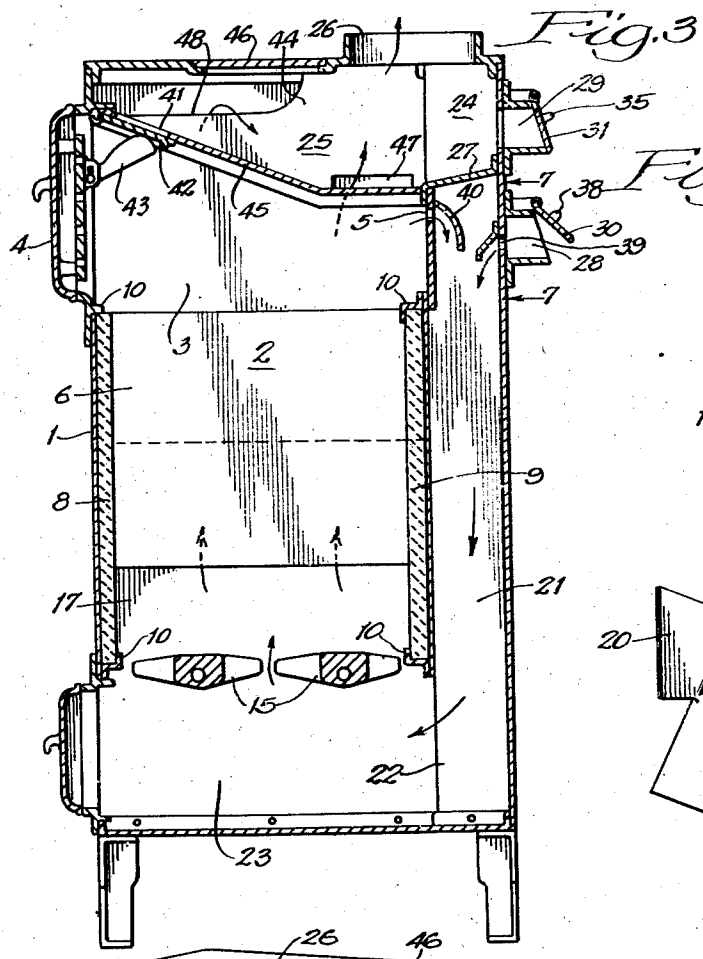


Fig. 5

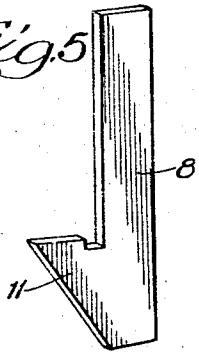


Fig. 6

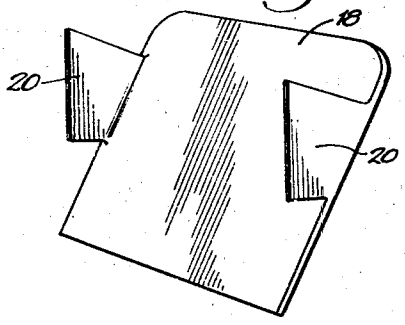


Fig. 4

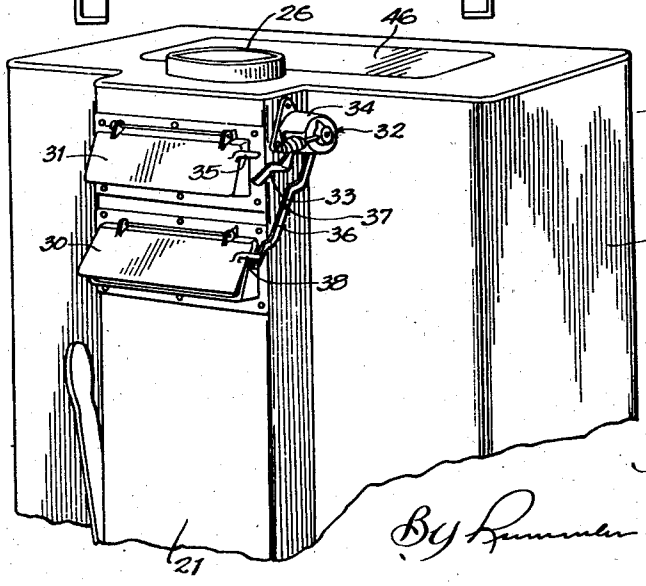
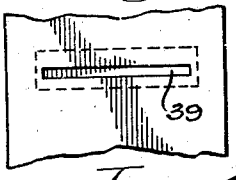


Fig. 7



Inventor:
Paul Wingert,
By Rummler Rummler & Davis
Attorneys.

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UNITED STATES PATENT OFFICE

2,390,483

INTERNAL CONSTRUCTION FOR STOVES AND FURNACES

Paul Wingert, Montpelier, Ohio

Application June 19, 1941, Serial No. 398,785

6 Claims. (Cl. 126—73)

This invention relates to improvements in stoves and furnaces.

The main objects of this invention are to provide an improved internal construction for stoves and furnaces; to provide improvements in the construction of stoves and furnaces having a sealed magazine and a susperded fire brick lining on two sides of the fire pot, whereby combustion takes place at grate line and the products thereof are withdrawn at the grate line; to provide a device of this character having a suspended fire brick lining which is kept heated on both its sides while the stove is in operation to prevent "arching" or caking of the green and semi-green coal in the magazine to thereby allow free flowage of fuel downwardly toward the grate at all times; to provide, in a device of the class described, an improved safety means for the fuel magazine to prevent the creation of gas pressure therein and to obviate danger of explosion; to provide a combustion device of this character wherein the primary draft damper is located adjacent the upper end of the device to permit delivery of preheated air to the fire pot from below the grate line; to provide a magazine arrangement whereby the gases and the products of combustion are accumulated before passing out the stack; to provide a combustion device of this character wherein the velocity of travel of the products of combustion is relatively slow and completely under control at all times; and to provide a stove or furnace which is simple in construction, substantially automatic in operation and is more efficient and economical in operation.

An illustrative embodiment of this invention is shown in the accompanying drawings in which:

Figure 1 is a top plan view, with the top cover removed, of a stove construction embodying my invention.

Fig. 2 is a vertical cross sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a vertical cross sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a perspective view of the rear upper portion of the stove.

Fig. 5 is a perspective view of one of the lateral fire bricks used in the front and rear walls.

Fig. 6 is a perspective view of one of the baffle plates, and

Fig. 7 is a fragmentary view taken on the line 7—7 of Fig. 3 to illustrate the draft slot arrangement.

Referring to the drawings, my invention is shown embodied within a stove which comprises a shell 1 preformed to desired size and shape and constructed of any suitable material such as heavy steel; a sealed magazine 2, the upper part of which is constructed of a metallic casing 3 having the fuel feed door 4 on its front wall, and also provided with a safety vent 5 such as a slot or a series of apertures, as illustrated, in its rear wall. The lower part of the magazine is defined by fire bricks 6, 7, 8 and 9, forming the side walls and the front and back walls, respectively, all held in position by suitable brackets 10 on the lower margins of the casing 3. The lower ends of the fire bricks 6 and 7 forming the side walls are spaced away from the grates and are held in the position shown in Fig. 2 by the flange 11 integrally formed on each of the lower portions of the fire bricks 8 and 9, respectively, to provide openings 12 and 12' which form a communication between the lower portion of the magazine 2 and the radiators 13 and 14 respectively.

A set of grates 15 are located at the lower end of the magazine 2 and are held therein by suitable brackets 16. Also a pair of metallic baffle plates 17 and 18 are placed in the lower ends of radiators 13 and 14 respectively as shown in Fig. 2; the lower ends of these baffle plates bearing on grate brackets 16 and the upper ends bearing against the inner walls of the shell 1. Each baffle plate 17 and 18 is provided with a pair of integrally formed, inwardly protruding arms 19 and 20 respectively, set at right-angles to the face of the plate, the free ends of the arms 19 and 20 bearing against the outer side of the walls of fire bricks 6 and 7 respectively, so as to maintain the baffle plates in their "set" position.

The angle at which the baffle plates 17 and 18 are set is predetermined as the area of the openings 12 and 12' between the bottom of fire bricks 6 and 7 and the face of the baffle plates 17 and 18 respectively is definitely affected by the relationship of the angular position of the baffle plates to the bottom edges of fire bricks. It will be apparent that the greater the angle, the larger the opening and vice versa. It has been found that the combined area of both of the openings 12 and 12' should equal the area of the smoke pipe to obtain the best results. This results in a slow lazy flame travel through the radiators and, therefore, the products of combustion have more time to give up their heat before reaching the stack.

The distance between the bottoms of the fire bricks 6 and 7 and the grates 5 is also predetermined. From the results of innumerable experi-

ments, it has been found that this distance should be between 4 and 8 inches and this dimension is critical to the efficient burning of the fuel.

The draft supply tube 21 is fully described and claimed in my co-pending application Serial No. 377,511, now Patent No. 2,345,519, filed February 5, 1941, for Drop tube for stoves and furnaces. It is preferably constructed of sheet metal and formed as part of the shell 1, but it may also be formed separately and apart from the shell 1 and attached thereto by any suitable means. The tube 21 is preferably located on the rear wall of the stove in the manner shown in the drawings, but the tube may, however, be formed in or on either of the side walls of the shell and still be as effective as the arrangement illustrated herein.

This draft tube 21 is provided with an outlet opening 22 at its lower end, below the grate line, where it communicates with the ash pit 23, while the upper end 24 terminates in and forms a part of the separate upper chamber 25 from which the stack connection 26 leads. The draft tube is also provided with a partition plate 27 for separating the air intake inlets 28—29 which are located near the top of the stove, in the upper end of the tube, and are controlled by a primary draft damper door 30 and a check damper door 31, respectively.

The primary draft door 30 and check damper door 31 are controlled by a unitary thermostatic control device 32 such as illustrated in Fig. 4 of the drawings and which is mounted on the side wall of the draft tube substantially at the level of the check inlet 29. This regulator device is fully described and claimed in Patent No. 2,302,197, granted to Howard C. Edwards November 17, 1942, for Thermostatic combustion control for stoves and furnaces.

The control device shown is provided with an arm 33 which is integrally secured to the free end of a bimetallic coil, not shown, housed within the casing 34. This coil is subject to expansion and contraction under the influence of the heat of the gases passing through the chamber 25 and in the device shown is so constructed and arranged that increase in heat will cause the coil to contract, and decrease in heat will cause the coil to expand. Upon contraction of the coil the arm 33 will move upwardly and the upper edge of the free end of that arm will abut against the projecting lug 35 on the check damper door 31, and gradually open the door allowing cool air from outside of the stove to enter the upper chamber and break the draft effect of the chimney, or flue, not shown, connected at the outlet 26.

As the stove cools the bimetallic element of the coil expands causing the arm 33 to move downwardly until it abuts against the upper end of lever 36. This lever is pivoted intermediate its ends at 37, on the side wall of tube. Upon continued expansion of the coil and pressure of the arm 33 on the upper end of lever 36, the lower end of the lever 36 will swing upwardly until it abuts against the lug 38 on the primary draft door 30 to open said door. This allows air from the outside of the stove to enter the draft tube 21, whereupon it is drawn downwardly to the ash pit 23 and thence upwardly through the grates 15 to the fuel bed.

As combustion takes place on the grate, the products of combustion will pass off into the side passageways or radiators 13—14, see Fig. 2, and thence upwardly into the upper chamber 25 from which they pass through the stack opening 26 into the chimney, not shown.

In order to prevent the fire in the stove from burning at greater than a predetermined rate, I have restricted the primary draft opening 28 by providing a baffle plate 38 and an elongated opening 39 of predetermined size leading into the draft tube 21. The upper margin of the opening is bent inwardly to provide a means for directing the air coming through the primary draft opening, downwardly into the tube 21. This arrangement provides a reduction of pressure in the upper end of the tube, as a result of which any gas which may accumulate in the upper portion of the magazine 2 is drawn into the tube through the series of small apertures or safety vents 5 formed in the rear wall of the magazine. Such gas is normally drawn into the tube 21 and is admixed with the incoming air when the door 30 of primary draft inlet is open. When the draft door 30 is closed, such gas is also forced into the tube 21 by the pressure created within the upper part of the magazine through the generation and accumulation of the gas, and is directed downwardly in the tube 21 by a second baffle 40 which extends downwardly inside the said tube from above the vents 5.

A primary function of the tube 21 is to preheat the incoming cool air for combustion, thereby increasing combustion efficiency. This preheating occurs as the cool air travels down the length of the tube during which it picks up some of the heat generated in the fire pot and passing through the fire brick lining. Hence, the incoming air will be warmed before it reaches the grates and prevent unnecessary coking of the burning fuel bed. This also keeps the rear walls of the stove relatively cool and thereby prevents heat from the back of the stove being transferred to room walls, which heat might be harmful if the stove were backed up close to a room wall as is customary in most installations. The tube will thus function as an insulator as well as a draft tube and air preheater.

In order to provide for the passage of accumulated gas from the upper portion of the magazine 2 into the stack when the feed door 4 is opened, I have provided an auxiliary or safety-by-pass opening 41 having a pivoted closure plate 42, which is controlled by the opening and closing of the feed door 4 on the inner side of which a loosely anchored, upwardly and inwardly extending camming arm 43 is attached. It will be apparent that when the feed door is opened, the plate 42 will swing downwardly automatically by gravity, thereby uncovering the opening 41 and allowing any gases accumulating in the upper portion of the magazine 2 to flow upwardly into the upper chamber 25, and thence out the stack opening 26. When the feed door is closed, it closes the by-pass opening 41 automatically. This by-pass construction is fully described and claimed in my copending application, Serial No. 377,825, filed February 7, 1941, now Patent No. 2,352,057, for Safety by-pass for stoves and furnaces.

As shown the upper chamber 25 is defined by a pair of baffle plates 44—44, the top wall 45 of the magazine 2 and the cover plate 46 of the stove. Each of the plates 44 is provided with slot 47 at the rear of its lower margin and is cut away, as at 48, at the forward part of its upper margin whereby communication is had between the radiators 13—14 and the upper chamber 25.

It will be apparent from the drawings that the products of combustion in the radiators must pass

through these restricted openings to reach the upper chamber 25, hence providing more time for the products of combustion to remain in radiators and allowing ample opportunity for them to give off their heat. The purpose of the openings 47 in the baffle plate 44 is to afford a more uniform distribution of the products of combustion as they pass through the radiators 13 and 14, thereby obviating cool areas in the upper rear portions of the radiators.

As the magazine of the stove is completely closed on top (wall 45) and has no direct connection with the stack, while the feed door 4 is closed, and because of the draft effect of the stack through the radiators 13—14, the gases driven off from the heated fuel in the magazine 2 are drawn downwardly from above and within the fuel bed, along the inner wall surfaces of the fire brick and through the hot coke on the grate, and thence through the side openings 12 where they mix with the air coming from the ash pit chamber 23 to convert the gases into a flame.

The result is that the fire bricks 6—7 become very hot and the heat thereof "cuts" the coal in the magazine 2 and causes it to move downwardly very slowly and easily; thereby preventing the coal from "freezing up" and caking or arching. Since there is but slight fuel bed resistance, an extremely low draft of about .05 inch is all that is necessary in normal operation. This results in a slow, lazy flame travel through the radiators, allowing maximum time for the transfer of heat to the room, and thereby giving lower than average stack temperatures.

Although but one specific embodiment of the invention is herein shown and described it will be understood that numerous details may be altered or omitted without departing from the spirit of the invenion as defined by the following claims.

I claim:

1. In a stove of the class described, the combination of a shell, a magazine having a top wall closing the upper end of the magazine, said top wall and shell forming an upper chamber at the top of the stove, grates defining the bottom of the magazine, said magazine being provided at the grates with openings, an ash pit located below the magazine, radiators arranged outside of the magazine and within said shell and extending from the chamber to said openings and having open ends located thereat, said radiators forming a communication between the chamber and the lower end of a magazine, an elongated down draft tube disposed vertically on the rear wall of said shell and having check and draft dampers positioned thereon adjacent the upper portion of said tube and in close proximity to each other, said check damper having direct communication with said upper chamber, the lower end of said tube having an outlet opening communicating with said ash pit below said grates, means in said tube separating air entering the check and draft dampers, and common means for actuating said dampers, the lower open ends of said radiators constituting sole outlets for the products of combustion whereby combustion is caused to take place at the grate line only.

2. In a stove of the class described, the combination of a shell, a magazine having a top wall closing the upper end of the magazine, said top wall and shell forming an upper chamber at the top of the stove, grates defining the bottom of said magazine, an ash pit located below said magazine, the latter being provided at the grates with openings, radiators located outside said magazine and within said shell and extending from the chamber to said openings and having open lower ends and forming a communication between the chamber and the lower portion of the magazine, an elongated down draft tube disposed vertically on the rear wall of said shell and having check and draft dampers positioned on it adjacent the upper portion of said tube and in close proximity to each other, said check damper having direct communication with said upper chamber, the lower end of said tube having an outlet opening communicating with said ash pit below said grates, means in said tube separating air entering the check and draft dampers, and means for actuating said dampers, the open lower ends of the radiators constituting sole outlets for the products of combustion from the fire and adapted to cause combustion to take place at the grate line only.

3. In a stove of the class described, the combination of a shell, a magazine having a top wall closing the upper end of the magazine, said top wall and shell forming an upper chamber at the top of the stove, a fire brick lining defining a fire pot in the lower portion of said magazine, said fire pot being provided at opposite sides with openings located at the bottom of the fire pot, grates defining the bottom of the magazine and located at said openings, radiators, one on each side of said magazine and provided with open lower ends and extending from the openings in the fire pot to the top chamber and forming a communication between the magazine and said chamber, a vertically disposed down draft tube having a primary damper at its upper end adjacent the top of the stove and having a discharge opening at its lower end below said grates, a check damper on said tube arranged adjacent said primary draft damper and having direct communication with said upper chamber, a baffle plate in said tube located intermediate said primary draft damper and said check damper, common means for actuating said dampers, the upper end of said magazine having an opening in its wall effecting communication between the magazine and said down draft tube for passage of any gas accumulating in the upper portion of the magazine, the open lower ends of said radiators constituting the sole outlets for the products of combustion from the fire and causing combustion to take place at the grate line only.

4. In a stove of the class described, the combination of a shell, a magazine having a top wall closing the top of the magazine, said top wall and shell forming an upper chamber at the top of the stove, grates defining the bottom of the magazine, an ash pit below said grates, a down draft tube on the outer side of said shell having communication at its lower end with said ash pit, the lower end of said magazine being lined with fire brick to define a fire pot, the lower ends of the side wall fire bricks having openings four to eight inches extending upwardly from the grates, radiators within said shell extending from said upper chamber and having open lower ends located at the openings in the side walls of the fire pot, said radiators forming communication between the magazine and the upper chamber and the open lower ends of the radiators constituting the sole outlets for the products of combustion from the fire and causing combustion to take place at the grate line only, baffle plates extending upwardly from the grates and arranged to restrict said openings, said magazine having safety vents communicating with said tube, pri-

mary and check dampers on said tube adjacent the upper end thereof and located in close proximity to each other, a baffle plate in said tube located intermediate said dampers, and common means for said dampers.

5. In a stove of the class described, the combination of a shell, a magazine having a top wall closing the upper end of said magazine, said top wall and shell forming an upper chamber at the top of the stove, grates defining the bottom of the magazine, said magazine being provided adjacent the grates with openings, an ash pit below the magazine, radiators located outside of said magazine and within said shell and extending downwardly from said chamber and having open lower ends located at said openings and forming a communication between the chamber and the magazine, the open lower ends of the radiators constituting the sole outlets for the products of combustion and causing combustion to take place at the grate line only, an elongated down draft tube disposed vertically on the rear wall of said shell and having check and draft dampers positioned thereon adjacent the upper portion of said tube and in close proximity to each other, said check damper having direct communication with said upper chamber, the lower end of said tube having an outlet opening communicating with said ash pit below said grates, means in said tube separating air entering said check and draft dampers, common means for actuating said dampers, and a safety vent for withdrawing any gas accumulating in the upper portion of said magazine and directing it into said draft tube.

6. In a stove of the class described, the combination of a shell, a vertical magazine having a top wall closing the upper end of the magazine and spaced from the top of the shell to form an upper chamber at the top of the stove, grates defining the lower end of the magazine, radiators extending upwardly from the lower portion of the magazine on the outside thereof, said magazine having fire brick walls and the fire brick walls adjacent the open lower ends of said radiators terminating a predetermined distance above said grates and forming openings providing communication between said magazine and said radiators adjacent the grate line, angularly disposed plates extending upwardly and outwardly from said grates into said radiators to provide bottom closures therefor, said plates being so positioned as to predetermine the areas of effective opening between said plates and the lower edges of the fire brick adjacent said radiators, the open lower ends of the radiators constituting the sole outlets for the products of combustion from the fire and causing combustion to take place at the grate line only, a down draft tube on the outside of said shell having a primary damper at its upper end adjacent the top of the stove and having a discharge opening at its lower end below the grates, a check damper on said tube adjacent said primary draft damper having direct communication with said upper chamber, and a baffle plate in said tube located intermediate said primary draft damper and said check damper.

PAUL WINGERT.