June 6, 1944. N. H. CARGILE 2,350,546

COAL-GAS STOVE OR HEATER

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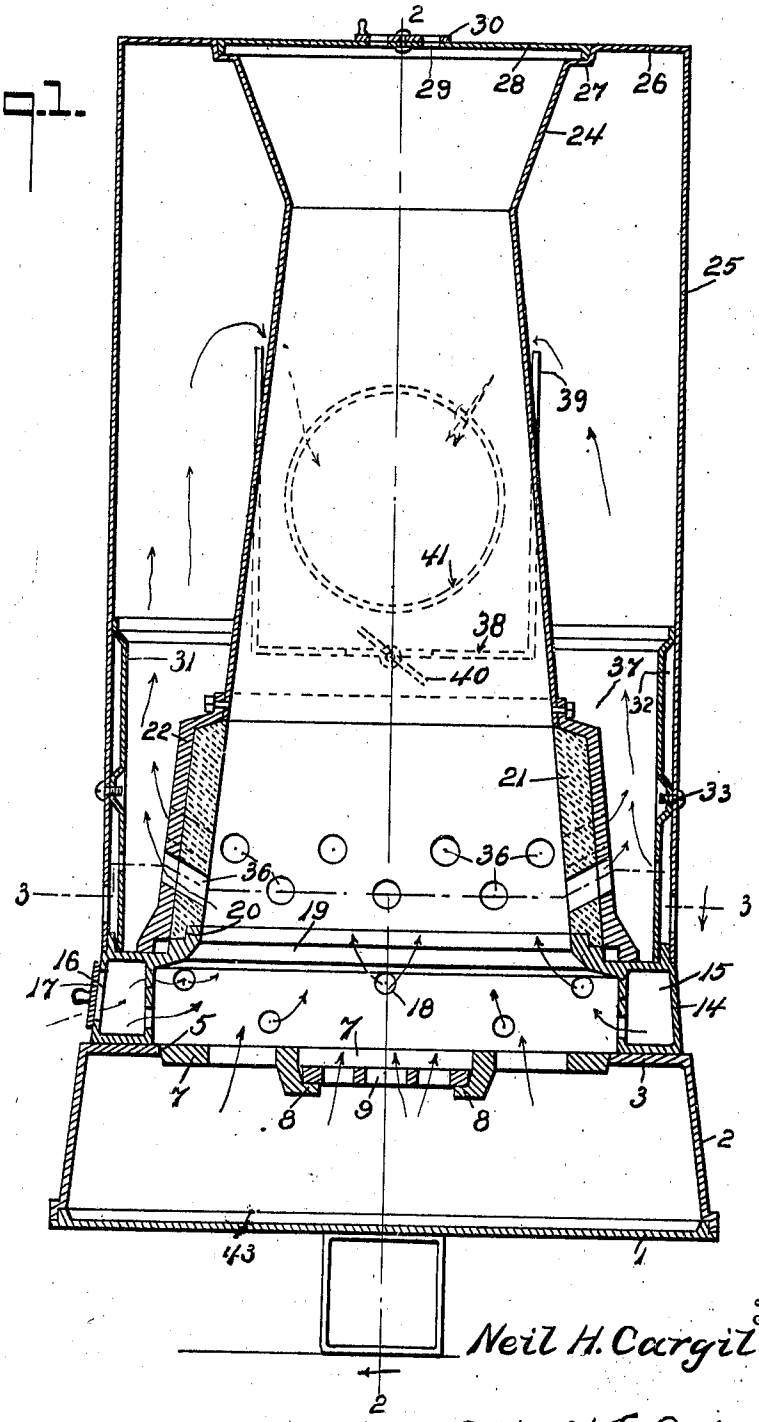
Fig. 1.



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COAL-GAS STOVE OR HEATER

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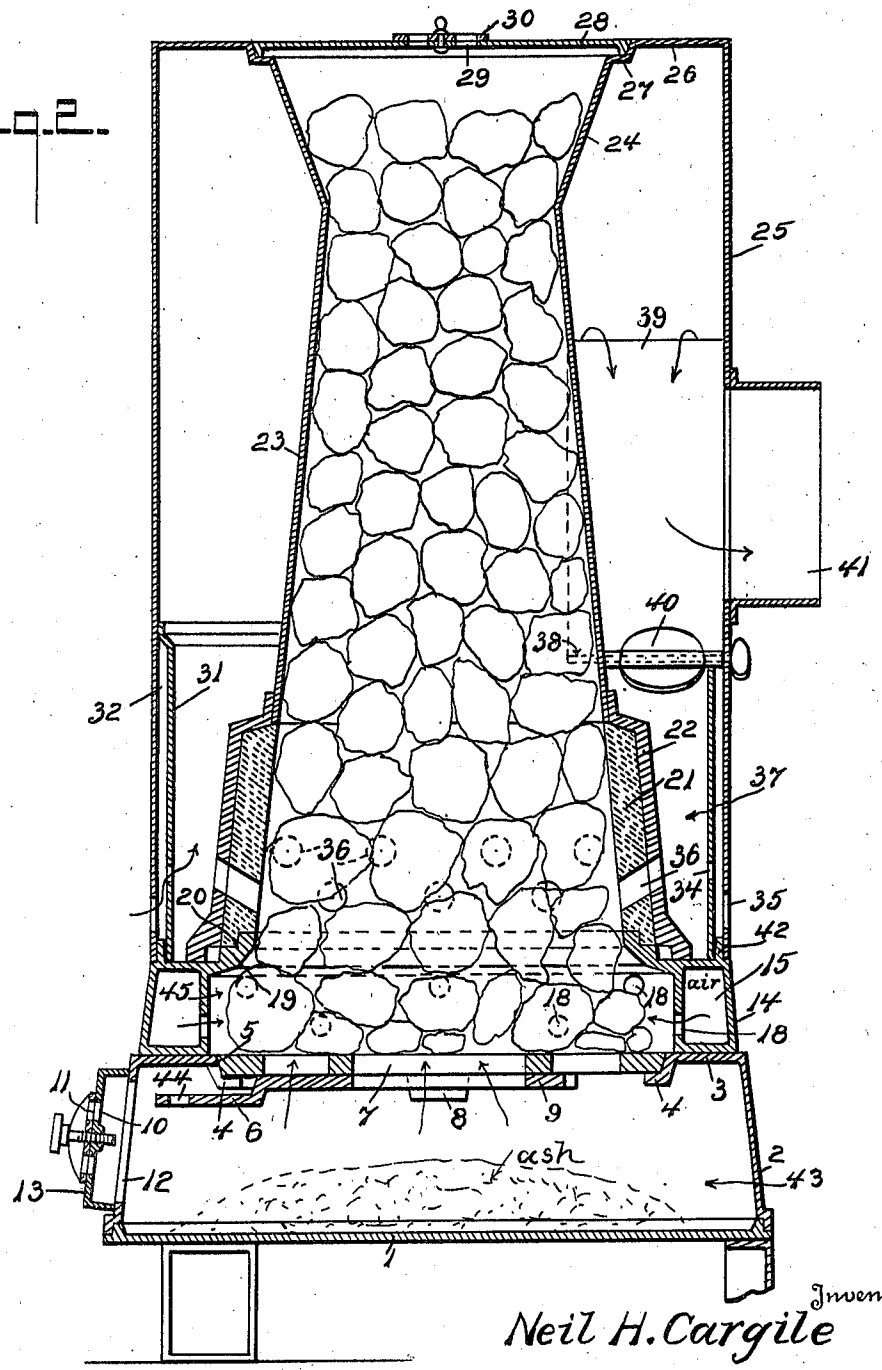
Fig. 2.



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COAL-GAS STOVE OR HEATER

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Fig. 3.

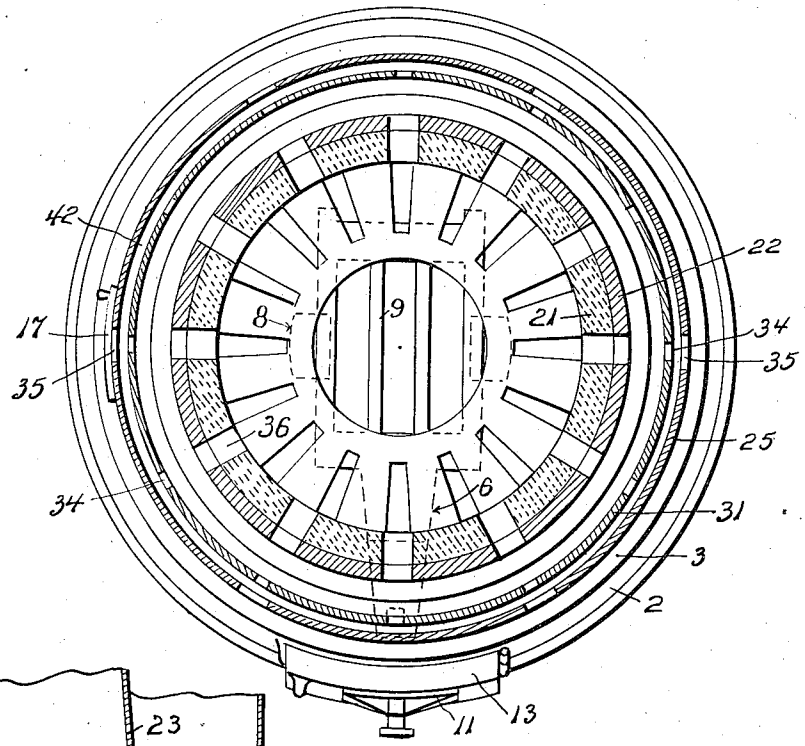

Fig. 4.

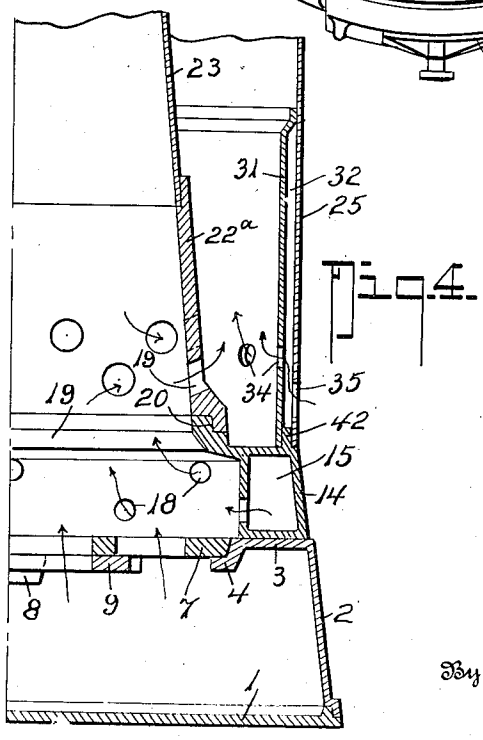

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Fig. 5.

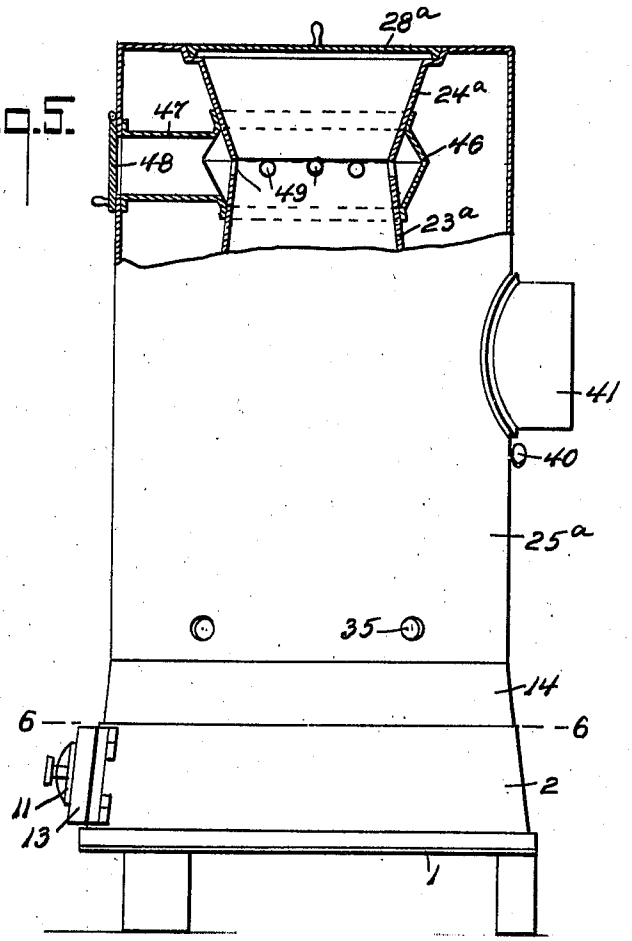
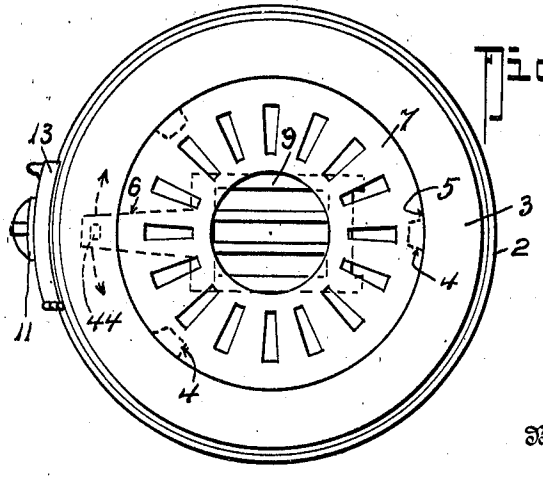


Fig. 6.



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Patented June 6, 1944

2,350,546

UNITED STATES PATENT OFFICE

2,350,546

COAL-GAS STOVE OR HEATER

Neil H. Cargile, Nashville, Tenn.

Application August 26, 1940, Serial No. 354,312

2 Claims. (Cl. 126—73)

My invention relates to magazine type heating stoves, and it has for an object to provide a stove or heater of the character referred to which will efficiently burn various kinds of solid fuel, and especially coal.

Heaters and stoves of the general type to which my invention relates are known; see, for instance, Patents No. 231,163 to Hamlin, Aug. 17, 1880, No. 984,200 to Easters, Feb. 14, 1911, but so far as I am aware all such stoves or heaters heretofore known are defective in a number of respects which render them inefficient in operation and costly to manufacture and maintain. A further object of my invention is to overcome the defects in those stoves and heaters of the prior art and to provide an inexpensive, rugged, highly efficient and safe stove or heater in which the formation of gas, tar, etc. in the magazine in sufficient quantity to choke the fuel is avoided.

Another object is to provide a more efficient stove or heater in which the combustion is so complete that the formation of heavy or black smoke is prevented.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends the invention still further resides in the novel details of construction, combination and arrangement of parts, all of which will be first fully described in the following detailed description, and then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which:

Fig. 1 is a central vertical longitudinal section of one embodiment of the invention.

Fig. 2 is a vertical section on the line 2—2 of Fig. 1, lumps of coal being indicated in the heater or stove.

Fig. 3 is a horizontal section on approximately the line 3—3 of Fig. 1.

Fig. 4 is a detail vertical section of a modification of the invention.

Fig. 5 is a side elevation and part section showing a slight modification of the invention.

Fig. 6 is a horizontal section on the line 6—6 of Fig. 5.

In the drawings, in which like numbers of reference indicate like parts in all the figures, 1 is the bottom or floor plate on which the base section 2 sets.

The base section encloses an ash-pit 43 and it has a top wall 3 with a circular opening 5 and depressed lugs 4 forming a support in which a rotatable grate 7 sets. Support lugs 8 support a sliding grate section 9 which can be shaken by means of a suitable grate shaker (not shown) hooked into hole 44 in the arm 6. The second or sub-base section 14 is set on the top 3 of the base section 2. The base section 2 and the sub-base or second section 14 are preferably made of cast iron, although, if desired, they may be made in one piece or made of welded steel construction.

The sub-base casting 14 is hollow to enclose an air chamber 15 into which air is admitted through an opening 16 in the outer wall of the casting, which opening 16 is controlled by a suitable damper or door 17. Air is admitted to the ashpit 43 through openings 10 controlled by a damper 11, there being provided a clean-out opening 12 closed by a door 13. See Fig. 2.

The inner wall of the sub-base casting 14 has two rows of circular annularly arranged and staggered openings 18 which pass air horizontally to the fuel directly above and adjacent the grates. By arranging the holes 18 equidistant apart the primary air is uniformly fed to the fuel.

The magazine supporting ring 19 of the sub-base casting is stepped at 20 and has an opening of substantially less diameter than that of the inner wall having the air openings 18. This provides means to prevent the fuel or ash from clogging the air holes 18 as a space 45 is left below the shelf-like ring 19.

Set on the sub-base around the ring 19 is a third casting 22 which in turn supports the magazine proper.

The casting 22 is preferably lined with fire brick or clay 21 (see Fig. 1), although it may be left unprotected as at 22a (see Fig. 4) if desired.

The magazine proper comprises, preferably, two frusto-conical shells 23 and 24, the ends of lesser diameter being equal and joined together. The end of greater diameter of the lower or main shell 23 is lowermost and is mounted on the casting 22. The inside face of the shell 23 and that of the fire clay 21 (Figs. 1 and 2) or casting 22a (Fig. 4), as the case may be, are preferably flush with one another, but may be offset outwardly if desired.

The larger end of the shell 24 is uppermost and is secured in any suitable way or made integral with the recessed part 27 of the top 26 of the outer shell or casing 25 which fits over the flange 42 of the sub-base 14. A cover 28 sets in the recess 27 and closes the upper end of the magazine. The cover has holes 29 controlled by a suitable damper 30.

In another form (Fig. 5) the damper is omitted from the cover and a chamber 46 is formed around the neck of the magazine, to which

chamber air from the outside is led by means of a pipe 47 controlled by a damper 48. A series of air holes 49 in the wall 23a just below the neck, passes the air into the magazine.

That portion of the outer shell or casing 25 which surrounds the hottest part of the combustion space 37 is protected by an inner shell 31 secured at 33 and spaced from casing 25 to provide an air chamber into which air is admitted through a set of (preferably six) openings 35 at the lower level of the air chamber or space 32, a set of (preferably twelve) openings 34 in shell 31 at the level of the discharge ends of the lower row of gas passages 36 being provided. The openings 35 and 34 are symmetrically disposed around the axis of the heater or stove and the openings 34 are about two-thirds the size of the openings 35.

41 designates the smoke outlet or flue and 39 vertical smoke baffles at the sides of the outlet 41. 38 designates a horizontal smoke baffle below outlet 41, the baffle 38 having an opening controlled by a damper 40 which, in normal operation, remains closed.

The grate 7, 9 is so mounted in that it may be shaken in a horizontal rotary direction. Also, grate part 9 can be used as a draw center grate.

The heater, as shown, is cylindrical in shape (preferred form), but may be made square or oblong if desired.

Primary air is drawn in via opening 16 into chamber 15 and is sucked through openings 18 to support combustion just above the top of the grate. Secondary air is drawn in through holes 35, 34 into the flame zone 37 which causes the air to mix properly with the gases expelled through the ports 36 into the combustion chamber, thereby causing efficient combustion of unburned gases from the fuel that are expelled through the openings 36.

In Fig. 5, those parts which are exactly like the corresponding parts in the preceding figures bear the same reference numbers but those which have been modified have the same reference numbers plus the index letter *a*.

Operation

The fire is started with wood placed on the grate; damper 40 is opened wide for direct draft to chimney; damper 17 is opened wide, and damper 11 is opened. Damper 30 is also opened.

After the fire has been kindled with wood, the damper 40 will be closed as soon as sufficient heat has gone up the stove pipe to set up proper draft for complete combustion. This damper is controlled either manually or thermostatically as desired.

Coal, wood, or other type of solid fuel is fed into the magazine to fill the same. The dampers 11 and 16 are adjusted to give the proper amount of air for clean combustion.

The only escape of the products of combustion from the fire pot 21, 22 and the magazine is via ports 36. The heat from the flowing fuel in the fire pot (21, 22) is imparted to the fuel above and since a down draft of fresh air via damper-controlled openings 29 is created through the fuel to the fire, there is a coking action set up, liberating gases which are drawn down through the fire and out through the ports 36 into the combustion chamber where they meet the auxiliary air entering that chamber via openings 34 and are burned with a clear, clean flame. At the same time, of course, the coke that is continually being fed down into the fire pot from the magazine 23, 24 is also being consumed.

Since the coke that is fed down into the fire pot 21 requires an air blast to burn properly, the air openings 18 and the air chamber 15 are required to cause the coke to burn properly for the different heat requirements of the stove or heater, that is at low, medium and high fire. In the heater shown, the air is drawn through the openings 18 sidewise or in horizontal direction toward the center of the heater and thus the coke is caused to burn better when the heater is burning at either the low, medium, or high fire times.

By my arrangement of ports and air supplying openings, etc., the actual buring of the fire stays in the lower part of the fire pot 21 or 22a, with the maximum combustion taking place in the space from just above the ports 36 down to the top of the grate.

If the combination of holes 18 with the different parts of my heater, arrayed as shown and described, were not used, I have found that the fire does not burn out fast enough to the very bottom near the top of the grate and has a tendency to climb or burn upwardly into the magazine, a thing to be avoided for obvious reasons.

The arrangement of the air chamber 15, the air holes 18 and the secondary air holes 35 and 34, with the design of the fire pot 21 or 22a, and also the bringing of the air through the top at opening 29 or openings 49, which air flows down through the fuel carrying with it the gases which are generated from heating the coal in the magazine, the gases finally going through the fire bed itself and there being partly consumed, the parts of the gases not so consumed being thoroughly consumed after leaving the ports 36 when they come in contact with the secondary air from holes 34, constitute a novel combination resulting in a more efficient satisfactorily operating, solid fuel burning stove or heater than any heretofore known.

The dampers may be manually controlled or themostatically controlled by any well known means if desired. The damper 11, after the several dampers have once been set for maximum combustion, is the only one which will require manipulation to increase or diminish (control) the action of the stove or heater.

Damper 17 is set so that, with damper 11 closed, only enough air gets through the holes 18 to keep the fire alive. Then, when more heat is required, damper 11 is opened to the amount necessary to get the desired degree of heat from the stove or heater.

By the proper adjustment of damper 30 coal tar and heavy distillates formed during the coking process are prevented from choking the fuel in the magazine; i. e., the fuel lumps are prevented from sticking together and blocking the down feed.

Making the greater part 23 of the magazine of frusto-conical form with the larger end down assists in the free gravitation of the fuel to the grate.

By baffling the products of combustion, as shown, the smoke pipe connection 41 can be kept low so that it can be connected to a fire-place opening without the use of elbows, and, further, this baffling of the gases causes them to take a long path before getting to the flue outlet, thereby heating all parts of the outer wall 25.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the construction, operation and advantages of the invention will be clear to those skilled in the art to which it relates.

What I claim is:

1. In apparatus of the class described, a base casting enclosing an ash pit and having a controlled air-admitting means, said base casting having an upper wall provided with an opening, a grate in said opening, a sub-base comprising a hollow-walled member set on said base casting above and encircling said grate, adjustabe means to admit outside air into the hollow of said wall of said sub-base, said sub-base having at least one annular series of air ports for delivering air to fuel directly above and in proximity to the grate, a magazine for fuel supported by said sub-base and including adjacent and above the sub-base at least one annular series of upwardly outwardly directed gas ports, a closure having a controlled air-admission means for the upper part of said magazine, an outer casing enclosing said magazine and spaced from the same to comprise a combustion chamber, a smoke outlet from said combustion chamber, and a U-shaped baffle between said magazine and said outer casing below and at the sides of said smoke outlet and having in its bottom portion a damper-controlled opening for direct draft to the smoke outlet.

2. In a heater, a base member enclosing an ash pit, a grate carried by the base member, a hollow wall sub-base set on the base member and containing an air chamber immediately above and in close proximity to the grate, said sub-base having air openings arranged at intervals around its axis to pass air sidewise to fuel on the grate, controlled means to admit air into said air chamber, a magazine support ring extending inwardly of said sub-base member above said air openings, a third member set on said ring and embracing the fire zone of the heater, a frusto-conical magazine section proper secured at one end to the top of said third member, a lid for closing said magazine section proper, an outer shell enclosing said magazine proper and spaced therefrom and set on said sub-base member, the space between said outer shell and said third member constituting a combustion chamber flame zone, said third member having at least one annularly disposed row of gas ports to said flame zone, means to admit air through the wall of said outer shell into the flame zone, and means to pass the products of combustion to the outside of said outer shell, said magazine proper near its upper end having a constricted neck, a chamber surrounding the constricted neck, said magazine having air passages in its wall from said chamber into the interior of the magazine, a pipe extending from said chamber to atmosphere, and a baffle between said magazine and said outer casing below and at the sides of the smoke outlet and having in its bottom portion a damper-controlled opening for direct draft to the smoke outlet a damper for controlling air passage through said pipe to said last mentioned chamber.

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