

May 29, 1923.

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B. F. CALDWELL

FLOOR HEATER

Filed March 14, 1921

2 Sheets-Sheet 1

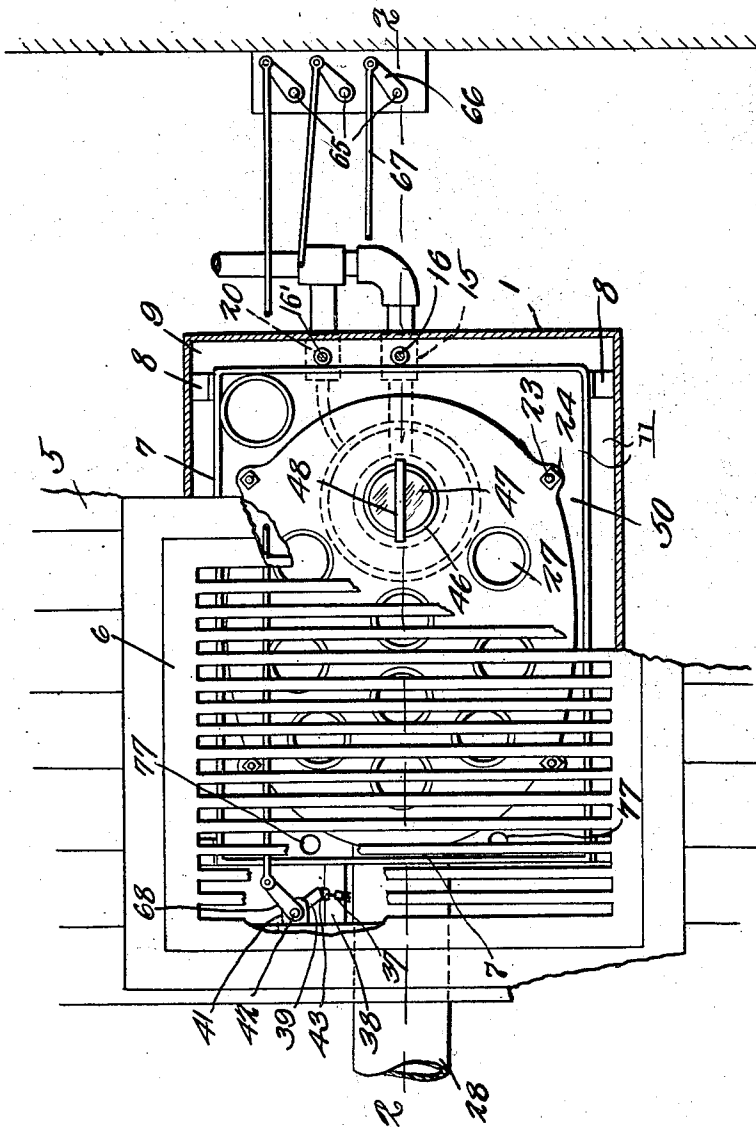


Fig. 1.

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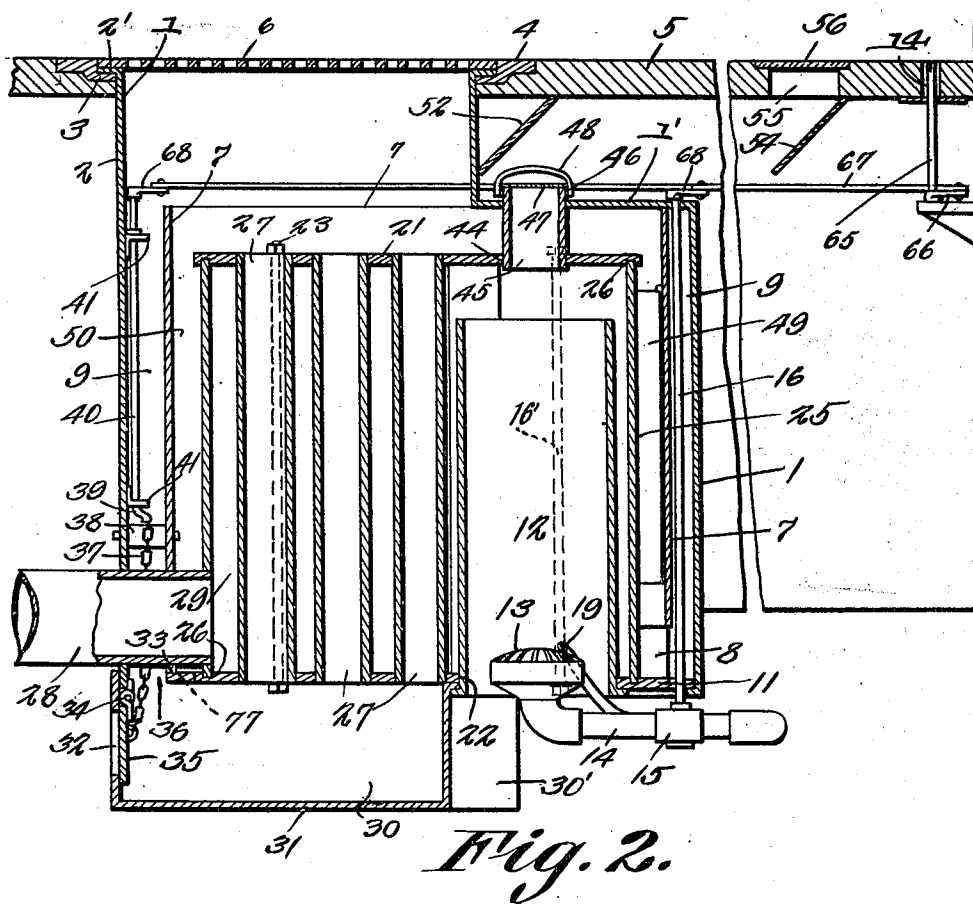


Fig. 2.

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UNITED STATES PATENT OFFICE.

BENJAMIN F. CALDWELL, OF POMONA, CALIFORNIA.

FLOOR HEATER.

Application filed March 14, 1921. Serial No. 452,022.

To all whom it may concern:

Be it known that I, BENJAMIN F. CALDWELL, a citizen of the United States, residing at Pomona, in the county of Los Angeles and State of California, have invented a new and useful Floor Heater, of which the following is a specification.

This invention relates to floor heaters of that type utilizing gas as a fuel, one of the objects of the invention being to provide a simple and compact structure which can be positioned readily under the floor of a room, where it is adapted to take cold air from out of doors or from the surrounding atmosphere, heat the air and discharge it into the room to be heated, the circulation of the heated air being independent from that of the products of combustion so that none of the combustion products can pass into the room being heated.

Another object is to so construct the furnace as to insure maximum combustion of the fuel and render the same practically odorless.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that, within the scope of what is claimed, changes in the precise embodiment of the invention shown can be made without departing from the spirit of the invention.

In the accompanying drawings the preferred forms of the invention have been shown.

In said drawings—

Figure 1 is a plan view of the furnace, parts being broken away.

Figure 2 is a section on line 2—2, Figure 1.

The outer casing 1 is rectangular and has a portion thereof extended upwardly at 2 and provided with a flange 2' extending outwardly from its upper edge and resting on the flange 3 extending inwardly from the register frame 4, said frame 4 being embedded into the floor 5. A register grate 6 rests upon the flange 2' with its upper face flush with the upper face of the frame 4 and the floor 5.

The outer casing 1 is provided with a bottom plate 11 extending throughout the width thereof and also throughout the length of

the outer casing except at one end where the bottom is spaced from the adjoining end wall of the outer casing 1 to provide a port 36 extending throughout the width of the interior of the outer casing 1. An inner casing 7 is mounted upon legs 8 which serve to space said inner casing from and support it above the bottom 11. This inner casing has all of its walls spaced from the corresponding walls of the outer casing 1 so that an air passage 9 is thus provided between the two casings, this passage extending continuously around the inner casing and opening under said inner casing into the space surrounded thereby. A portion of the outer casing 1 is closed at the top, as shown at 1' and overhangs a portion of the inner casing 7 as shown particularly in Figure 2.

The plate 11 not only constitutes the bottom of the outer casing 1 but also constitutes the bottom plate of a radiator. A section of a pipe is inserted upwardly through and secured within this bottom plate 11 near one wall of the inner casing 7 and at a point under the overhanging top 1' of the outer casing. This pipe forms a combustion chamber 12. A gas burner 13 is centrally mounted in the lower end of the combustion chamber 12 upon the gas pipe 14, there being a gas cock 15 in said pipe, having a stem 16. The pilot burner 19 is mounted upon a branch of the pipe 14 and is controlled by a stop cock 20 similar to the stop cock 15 and operated in a similar manner by a stem 16'.

The radiator top 21 is a casting, oval-shaped in plan, and, as hereinbefore explained, the radiator bottom 11 is rectangular to fit the outer casing 1 and has an opening 22 for the combustion chamber 12. Bolts 23 extend through ears 24 upon the top 21 and through the bottom. The radiator casing 25 is inserted between the top 21 and the bottom 11, the edges of the casing extending into grooves 26 in the lower face of the top and the top face of the bottom. Flues 27 are fixed in openings in the top and bottom and form passages for the fresh hot air, said fresh hot air discharging upwardly through the grate 6. A smoke pipe or flue 28 leads outwardly from the chamber 29 within the casing 25 through the inner casing 7 and through the outer casing 1 to any suitable point of discharge, the products of combustion from the burner passing through

the radiator and then outwardly through the flue 28.

A secondary casing 30 extends downwardly from the outer casing 1 below the flues 27 and has a bottom 31. One end, 30', of this casing is recessed so as not to obstruct the end of the combustion chamber 12. This will be apparent by referring to Figure 2 wherein the said end of the secondary casing is shown in section. A fresh air inlet opening 32 is formed through the secondary casing 30 so that fresh air from out-doors will pass through the opening 32 into the casing 30 and upwardly through the flues 27 of the radiator. The passage or port 36 hereinbefore referred to and which extends throughout the width of the interior of the outer casing 1 provides means whereby air flowing downwardly between the inner and outer casings can pass into the secondary casing 30 and thence upwardly through the flues 27.

A hinge of the ordinary spring controlled type such as used on doors has been illustrated generally at 34 and is mounted upon the inner face of the secondary casing 30 above the opening 32 and a double acting flap door 35 is connected to this hinge, the tension of the spring of the hinge being exerted to throw the door downwardly and close the opening 32 so as to stop the draft from out-doors. A chain 37 is connected to the door 35 and extends upwardly through the opening 36 over a pulley 38 and is connected to an arm 39 fixed upon the lower end of a rock-shaft 40, said rock-shaft being mounted in bearings 41 secured to the inner face of the casing 1 and extending upwardly to the grate 6, the squared upper end 42 of the rock-shaft being in line with an opening through the grate so that the shaft may be operated with a key, and when a key is applied to the squared upper end 42 and the shaft 40 operated half a turn the door 35 will be swung upwardly to close the opening 36 and stop the down-draft passage 9 and open the outside draft through the passage 32. When the shaft 40 is operated a half a turn the arm 39 will move past the dead center and hold the door in position to close the opening 36 and when the shaft is operated in the opposite direction the spring of the hinge 34 will swing the door downwardly and close the opening 32. An opening 44 is formed in the radiator top 21 and a short section of pipe 45 is fixed in this opening and extends upwardly through the top of casing 1 at one side of extension 2 to form a sight tube directly above the burner 13. An annular band 46 fits the upper end of the tube 45 and a mica plate 47 is fixed in this band to close the opening through the tube, so that the operation of the pilot burner 19 and main burner 13 may be viewed through the mica. A bail 48 can be fixed

to the band 46 to form a handle extending diametrically across the mica 47 so that in some arrangements when it is desired to light the pilot burner 19 any suitable instrument may be caused to engage the bail 48 to remove the cap, consisting of the band 46 and mica 47, and a match or taper may be inserted downwardly through the tube 45 to ignite the gas in the combustion chamber 12. Then the cap may be replaced, the main burner turned on, and the pilot turned off. A water receptacle 49 is mounted upon the casing 7 next to the radiator so that the water may be supplied from time to time to the receptacle by removing the grate.

The pilot light burner 19 and the main burner 13 take all of their air from the outside. The products of combustion in the combustion chamber 12 pass upwardly over the upper end of the combustion chamber into the radiator, around the flues 27 and then outwardly through the smoke pipe 28. The heat will radiate into the flues 27 and into the chamber 50 within the casing 7 around the flues. Thus cold air within the room being heated will flow downwardly into the annular passage 9 and thence upwardly under the lower edges of the walls of the inner casing 7 where it will be heated by the walls of the radiator casing 25. If the damper or door 35 is in the position shown in Figure 2 a portion of the descending cold air will flow through the passage 36 and into the casing 30 and thence upwardly through the flues 27. By opening the door or damper 35 the passage 36 will be closed thereby and fresh air will be admitted to the casing 30 and will flow upwardly through the flues 27 into the room being heated.

Importance is attached to the fact that in operation the walls of the combustion chamber 12 become intensely hot and that the products of combustion will flow upwardly over these walls and downwardly into the space surrounding the flues 27 where the products are trapped and cannot back out of the furnace because to do so they would be compelled to rise and pass over the walls of the chamber 12 and down through the chamber 12. This is obviously impossible because of the draft set up through the combustion chamber and to the smoke flue 28.

The sight tube 45 is overhung by an inclined mirror or reflector 52 adapted to deflect the light rays from the sight tube horizontally under the floor to another inclined mirror or reflector 54 which can be arranged close to the ceiling of the room and under an opening 55 in the floor and which opening can be provided with a glass covering 56. Thus by glancing downwardly through the covering 56 it would be possible to see into the sight tube and determine whether the burners are lighted and properly regulated.

Crank arms 66 can be connected to operating stems 65 as shown in the drawings, these crank arms being connected by rods 67 to the stems 16 and 16' and shaft 40. Thus the parts operated by the stems and shaft can be controlled.

It is to be understood that various other modifications of this structure can be made to meet varying conditions, the principal features of the invention being the novel arrangement of the interior furnace structure whereby products of combustion are trapped within a highly heated structure to produce practically perfect combustion.

Instead of providing a single furnace and a single burner in each furnace it is to be understood that each furnace can have two or more burners if desired. Furthermore the furnaces can be arranged in clusters and placed under one control. This arrangement is so obvious that it is not deemed necessary to illustrate it or describe it in detail.

As most floor furnaces constitute traps in which dirt will collect, the present structure is provided with outlet openings 77 located wherever desired between the casing 25 and the casing 7. Thus by means of a suitable brush or the like any accumulation of dirt can be swept along the bottom 11 of the radiator and to the openings 77 through which it will fall into the secondary casings 30 from which it can be removed through the opening 32. These openings 77 will not interfere with the proper circulation of fresh air but will on the contrary facilitate such circulation.

It will be noted that in the furnace constituting this invention all portions are contacted by fresh air, thus maintaining the maximum heating value of the furnace and at the same time keeping the furnace cooled so that no parts can burn out. It will be noted that even the combustion chamber has cool fresh air passing up along its inner walls. As no fire leaves the combustion chamber 12 it will be apparent that the furnace tubes and other heat radiating surfaces are heated solely with hot air and at no time by direct contact with flame.

What is claimed is:—

1. In a furnace the combination with an outer casing having an open top portion and a grating extending over said open top portion for the downward flow of cold air and the upward flow of heated air, of a plate constituting the bottom of said casing, an inner casing spaced from the outer casing and from the bottom thereof and forming an annular space for the downward flow of cool air, a radiator top within and spaced from the walls of the inner casing, a radiator casing mounted on the bottom plate and supporting the top plate, a tube opening through the bottom plate and into the radiator casing near the top plate, said

tube discharging at its upper end into the radiator casing, an outlet flue for products of combustion, said flue extending through the walls of the radiator casing and the inner and outer casings, a secondary casing supported below the bottom plate, there being a port connecting the interior of said supplemental casing to the annular air space between the inner and outer casings, there being a fresh air inlet opening into the supplemental casing, a damper for normally closing said fresh air inlet, means for shifting the damper to open said inlet and to close communication between the supplemental casing and the air space between the inner and outer casings, and air flues connecting the top and bottom plates of the radiator and opening into the supplemental casing and into the upper portion of the inner casing.

2. In a furnace the combination with a bottom plate, a top plate, and a casing connecting the plates and cooperating therewith to form a radiator, of a combustion tube opening through the bottom plate and discharging upwardly into the upper portion of the radiator, an outlet flue for products of combustion extending from the lower portion of the radiator at a point remote from the combustion tube, air flues connecting the top and bottom plates and opening therethrough, a burner supported within the lower portion of the combustion tube, a casing surrounding the radiator, means therein for directing cold air downwardly within the casing and thence upwardly around the radiator, a secondary casing supported by the bottom plate and communicating with the air flues of the radiator, there being a port constituting a connection between the interior of the outer casing and the top of the secondary casing, said secondary casing having an inlet for fresh air, a damper, and means for actuating the damper to open the fresh air inlet and close communication between the interior of the outer casing and the secondary casing.

3. In a furnace the combination with a bottom plate, a top plate, and a casing connecting said plates to form a radiator, of a combustion tube opening through the bottom plate and discharging into the upper portion of the radiator, a burner supported within the lower end of the combustion tube, an outer casing housing the radiator and spaced therefrom, said bottom plate constituting the bottom of the outer casing, an inner casing interposed between the outer casing and radiator and spaced therefrom to form annular air spaces, said inner casing being spaced from the bottom plate to provide a passage for the flow of descending cold air inwardly against the radiator and for the ascent of said heated air within the inner casing and around the radiator, a sec-

ondary casing supported below a portion of the bottom plate and communicating with a portion of the space between the outer and inner casings, and air flues connecting the top and bottom plates and opening into the upper portions of the secondary casing and of the inner casing.

4. In a furnace the combination with a radiator bottom, a main casing connected to the marginal portion thereof and a grating for receiving heated air from the top of the main casing, of a pipe upstanding from the radiator bottom and forming a combustion chamber open at the top and bottom, a radiator casing mounted on the radiator bottom and spaced from the main casing, a radiator top mounted on the radiator casing, air flues secured at their ends within the radiator top and bottom, a secondary air casing secured to and arranged under the radi-

ator bottom at one side of the combustion chamber and opening into the air flues, means for directing air into the secondary casing to be heated, a smoke outlet flue extending from the lower portion of the radiator casing and through the main casing adjacent the bottom of the radiator, and a burner supported within the lower portion of the combustion chamber, said radiator constituting means for trapping products of combustion after passing downwardly from the open upper end of the combustion chamber.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

BENJAMIN F. CALDWELL.

Witnesses:

CHESTER B. CALDWELL,
EDWARD T. MICHAEL.