Sept. 3, 1957 C. S. BESSER 2,804,869

HORIZONTAL WARM AIR FURNACE

Filed Dec. 17, 1952 2 Sheets-Sheet 1

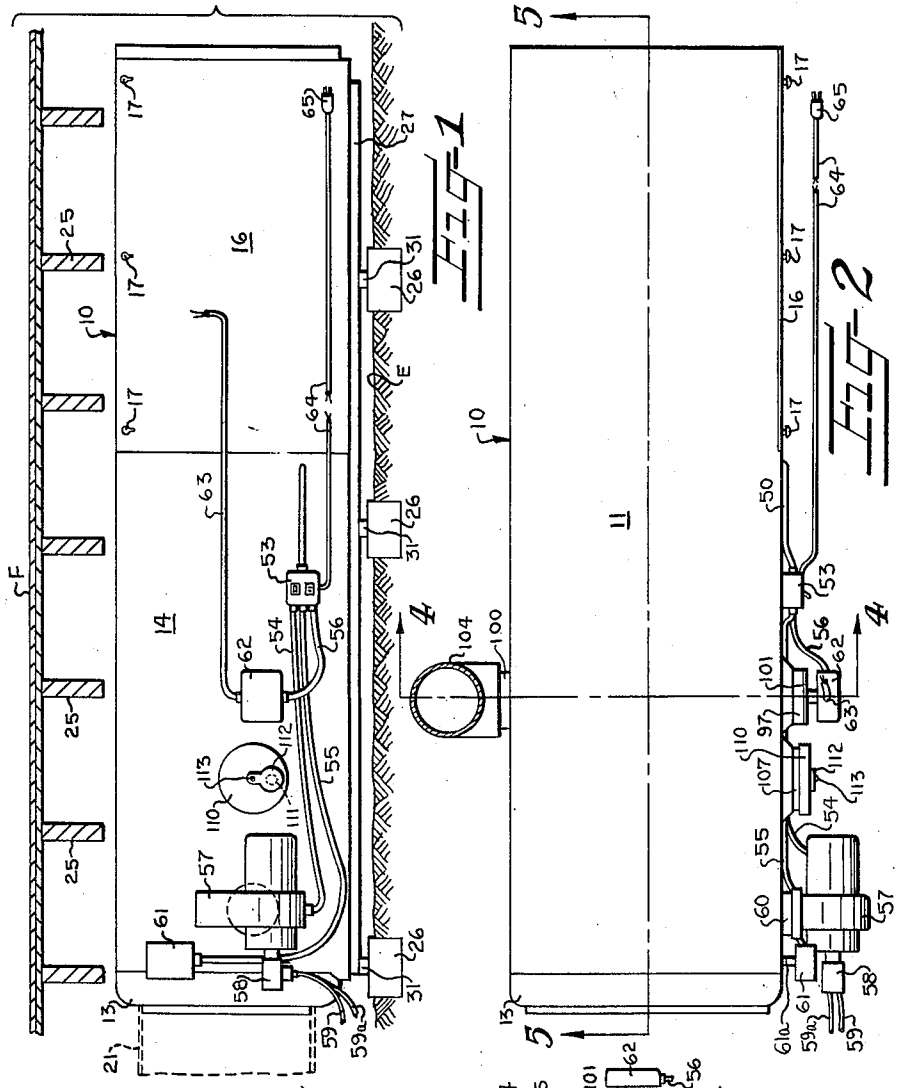


FIG-1

FIG-2

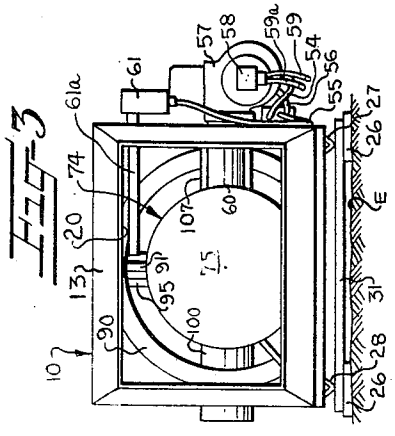


FIG-3

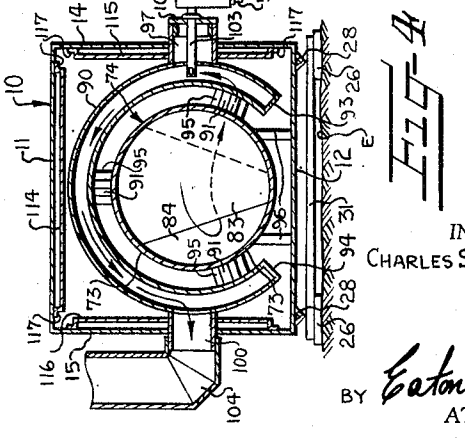


FIG-4

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HORIZONTAL WARM AIR FURNACE

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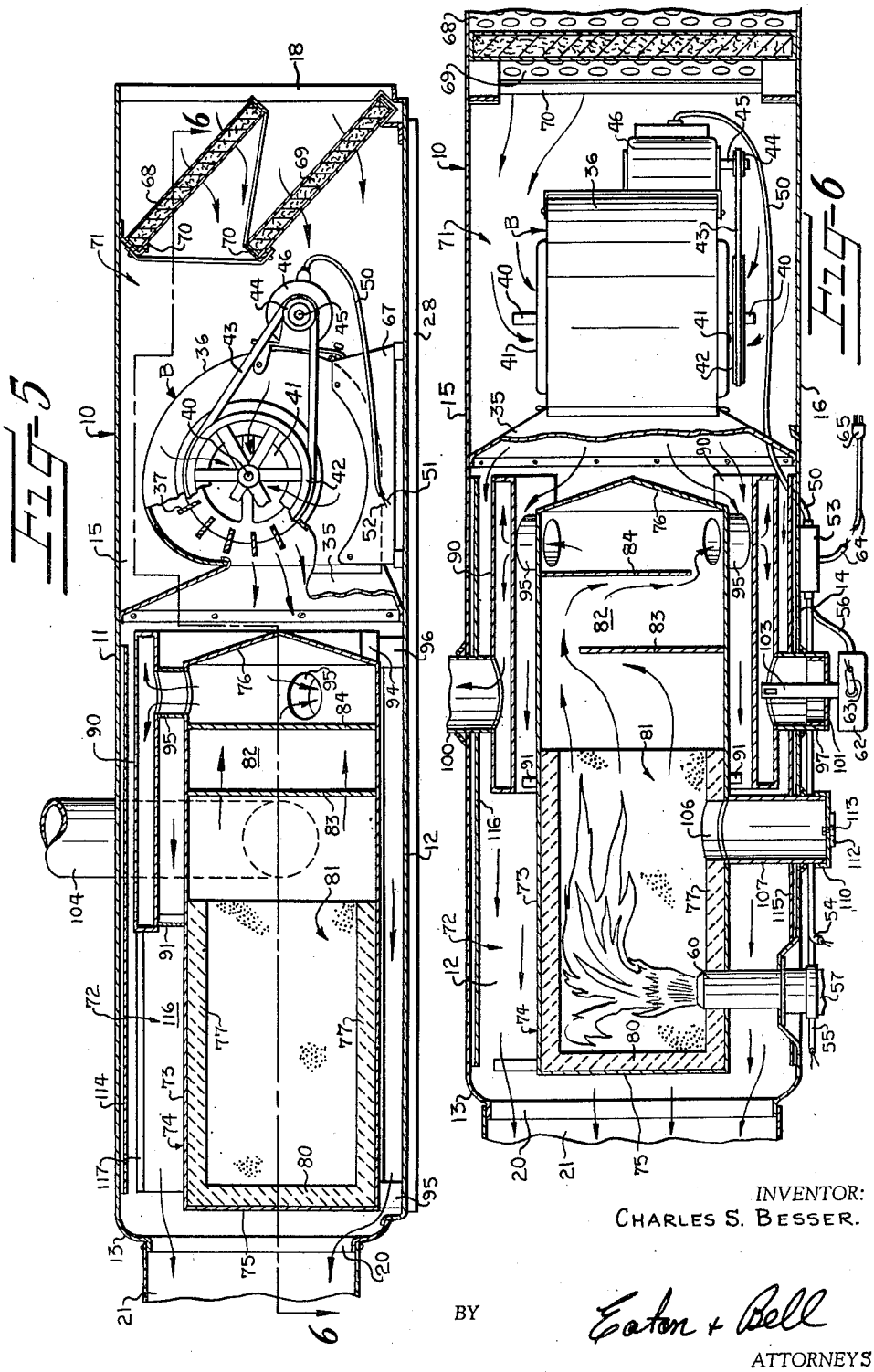


FIG-5

FIG-6

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United States Patent Office

2,804,869

Patented Sept. 3, 1957

2,804,869

HORIZONTAL WARM AIR FURNACE

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Application December 17, 1952, Serial No. 326,529

2 Claims. (Cl. 126—110)

This invention relates to warm air furnaces and more especially to furnaces which use oil or gas for fuel and have fans or blowers for circulating air through the house.

The primary object of this invention is to provide a horizontal furnace designed principally for under-floor installation in small homes and wherein the combustion chamber, heating chamber and the blower are axially alined to provide a compact heating unit thereby obviating the necessity of a utility room or basement being provided in the house. Also, such a heating unit or furnace may be suspended from the ceiling of a basement to thereby provide additional storage space in the basement which would ordinarily be taken up by the type of furnace which rests upon the floor.

More specifically, it is an object of this invention to provide a furnace comprising a casing enclosing an elongated warm air distributing chamber or compartment to one end of which the usual duct system may be connected and the other end of which has a blower connected thereto. A housing disposed in said warm air distributing chamber has a fire box or combustion chamber therein positioned in axial alinement with a heating chamber. The heating chamber is disposed adjacent the blower and is closed at its end adjacent said blower whereby the heated gases from the combustion chamber or fire box travel toward the blower while the blower causes the air exteriorly of the jacketed heating chamber and the fire box to flow in the opposite direction toward the warm air discharge end of the furnace.

It is still another object of this invention to provide a furnace of the character described wherein a hollow warm air radiator of tubular construction extends longitudinally of and is spaced from and substantially encircles the jacketed heating chamber. Conduits are provided, at the end of the jacketed heating chamber adjacent a blower, for directing the heated gases from the heating chamber to the radiator whereby the blower will be further enabled to efficiently distribute and force the heated air out of the exhaust end of the furnace and into the duct system.

It is still another object of this invention to provide a furnace of the character described wherein the heating chamber is provided with axially spaced transverse baffle plates wherein adjacent baffle plates extend inwardly from opposite sides of the heating chamber to thereby interrupt the flow of the heated gases or products of combustion from the combustion chamber through the jacketed heating chamber. A stack, which discharges the products of combustion from the heating chamber, is connected to said radiator and, thus, the heating chamber radiates most of the heat therefrom rather than the heat passing therefrom through the radiator and escaping through the stack.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings in which—

Figure 1 is a side elevation of the improved horizontal furnace showing the same disposed immediately below

the main floor joists of a house and resting upon blocks embedded in the earth beneath the house;

Figure 2 is a top plan view of the improved horizontal furnace;

Figure 3 is a view looking at the left-hand or discharge end of the furnace shown in Figure 1;

Figure 4 is a transverse vertical sectional view taken substantially along the line 4—4 in Figure 2 showing, particularly, the curved tubular radiator surmounting the jacket or housing of the heating chamber;

Figure 5 is an enlarged longitudinal vertical sectional view through the improved horizontal furnace, but showing a substantial portion of the blower in elevation;

Figure 6 is a longitudinal sectional plan view taken substantially along the line 6—6 in Figure 5 with the outer portion of the blower type oil burner broken away.

Referring more specifically to the drawings, the numeral 10 broadly designates an elongated tubular casing which is substantially rectangular in cross-section and in which the various parts of the furnace are adapted to be mounted. The casing 10 comprises a top wall 11, a bottom wall 12, a front wall 13, a right-hand side wall 14 and a left-hand side wall 15. The top and bottom walls 11, 12, and the side walls 14, 15, are all of substantially the same length. However, the rear portion of the side wall 14 is formed with an opening therein which is closed by a removable plate or cover 16 suspended on pins 17 carried by the side wall 15.

The right-hand or rear end of the casing 10 is open to form a cold air inlet or air ingress opening 18 and the front wall 13 is provided with a flanged opening 20 which is adapted to have connected thereto a suitable duct work or duct system a fragmentary portion of which is indicated at 21. It will be observed in Figure 1 that the improved furnace may be installed in relatively confined areas, such as between the main or first floor of a building and the shallow excavated earth therebeneath. The floor is indicated at F and said floor is supported on floor joists 25. The level of the earth beneath the floor F is indicated at E.

In this instance, the furnace is shown resting upon the ground or blocks embedded therein, the blocks being indicated at 26. However, it is to be understood that the furnace may also be suspended from the floor F by suitable straps, not shown, in the event that said furnace is positioned in a cellar or basement of a house.

The bottom wall 12 of the casing 10 is provided with a pair of longitudinally extending reinforcing supports 27, 28 which are disposed closely adjacent opposite side edges of the bottom wall 12 and extend substantially the entire length of the bottom wall 12. These supports 27, 28 may rest on suitable transverse frame members 31 which, in turn, rest on the spaced blocks 26.

Suitably secured to and spanning the distance between the top and bottom walls 11 and 12 and the side walls 14 and 15 is a funnel-shaped partition 35 which is provided with an opening therein to which the open end of a fan housing 36 of a blower B is communicatively connected. The blower B may be of any desired construction and is illustrated as a centrifugal type of blower in which a rotary fan 37 is mounted. The rotary fan 37 is fixed on a shaft 40 suitably journaled in the housing 36 and the side of the housing 36 has an air ingress opening 41 in each side thereof (Figure 6).

The fan 37 may be driven in any desired manner and, in this instance, one end of the shaft 40 has a pulley 42 fixed thereon which is driven by a belt 43 also mounted on a pulley 44. The pulley 44 is fixed on the shaft 45 of an electric motor 46 suitably secured to the rear surface of the blower housing 36. The electric motor 46 is preferably thermostatically controlled and has an electrical cable 50 extending therefrom in which wires 51 and 52 are disposed.

The end of the cable 50 remote from the electric motor 46 is connected to a combination junction box and master switch 53 from whence electrical cables 54, 55 and 56 extend. Cable 54 extends to a blower 57 of a gun type or blower type oil or gas burner 60 of conventional construction. The cable 55 extends to a fan and limit switch 61 having a thermal responsive element 61*a* extending therefrom through side wall 14 and into a chamber 72, to be later described, and the cable 56 extends to a so-called thermostatic stack switch 62.

An electrical cable 63 extends from the thermostatic stack switch 62 to a room thermostat, not shown, and a cable 64 extends from the master switch 53 to a plug 65 adapted to be connected to a suitable source of electrical energy, not shown.

Since the electrical connections for the electric motor 46 of the blower B and the various other electrical parts of the furnace are well known and constitute a conventional furnace control system of a type distributed by Minneapolis-Honeywell Regulator Co., Minneapolis, Minnesota, details of the electrical connections for operating the blower motor 46 and the blower 57 of the burner 60 and a further description thereof, are deemed unnecessary.

Liquid or gas fuel is circulated through a conventional pump 58 of the burner 60 by pipes 59, 59*a* connected to a suitable source of supply, not shown. The blower housing 36 is supported on suitable angle brackets or standards 67 suitably secured to the bottom wall 12 of the casing 10. Disposed adjacent the air intake opening 18 is a pair of angularly disposed air filter units 68 and 69 supported on suitable cross members 70 spanning the distance between and being suitably secured to the side walls 14 and 15 of the casing 10. The funnel-shaped partition 35 defines the front end of a blower chamber or compartment 71 and the rear end of a longitudinally extending air distributing chamber or compartment generally designated at 72.

The air distributing chamber 72 has a cylindrical wall 73 of a housing 74 disposed therein and extending longitudinally thereof, which wall 73 may be rectangular in cross-section, if desired. The housing 74 is spaced from the top wall 11, the bottom wall 12 and the side walls 14 and 15.

The front end of the housing 74 is closed by a flat plate or wall member 75 and the rear end thereof is closed by a conically formed plate or end wall member 76. The front portion of the interior of the cylindrical wall 74 is coated with a cylindrical wall 77 of refractory material and the inner surface of the front end wall 75 also has an end wall 80 of refractory material disposed thereagainst and forming the end wall of a fire box or combustion chamber generally designated at 81 in the front portion of the housing 74.

A unique method is employed in forming the fire box 81 which includes positioning a cylindrical form member inside of the housing 74 before the conical plate 76 is secured to the rear end thereof. The cylindrical form member is of such outside diameter that, when it is positioned axially adjacent the wall 75 of the housing 74, a space is provided between the exterior of the form member and the interior of the wall 73 of the housing 74 equivalent to the desired thickness of the refractory material. Of course, the housing 74 is then up-ended so that the end wall 75 rests upon the floor and the lower end of the cylindrical form member is spaced from the wall 75 a distance equal to the desired thickness of the refractory material. A refractory material in mastic form is then poured between the form member and the inner surfaces of the cylindrical wall 73 and the end wall 75 and, after the refractory material has set or hardened sufficiently, the form member is withdrawn from the fire box 81. Thus, the refractory material is cast in the elongated housing 74.

The rear end of the combustion chamber 81 is open and the cylindrical wall 77 of combustion material terminates substantially midway of the length of the cylindrical wall 73 in the rear portion of the housing 74.

The heating chamber 82 is partially closed by staggered baffle plates 83, 84 and, in this instance, the baffle plate 83 engages the inner surface of the right-hand side of the wall 73 in Figure 4 and extends inwardly and terminates in spaced relation to the opposite or left-hand inner surface of the cylindrical wall 73.

On the other hand, the baffle plate 84 extends from the inner left-hand surface of the cylindrical wall 73 and terminates in substantially spaced relation to the right-hand inner surface of the cylindrical wall 73. It will be noted that the free edges of the baffle plates 83, 84, that is, the edges thereof which are spaced from the cylindrical wall 73, are formed at angles relative to each other and whereby the lowermost corners of the free edges of the baffle plates 83, 84 are disposed in closer laterally spaced relationship than the uppermost corners of the free edges thereof. This arrangement of the free edges of the baffle plates 83, 84 is desirable due to the tendency of the heat generated by the burner 60 to rise and it is therefore desirable to cause greater resistance to movement of the heated products of combustion adjacent the upper inner surface of the cylindrical wall 73 than at the lower inner surface thereof.

It will be noted that the burner 60 extends through the wall 14 of the casing and penetrates one side of the cylindrical wall 73 and the cylindrical wall 77 of refractory material so the nozzle end thereof is disposed within the combustion chamber 81. Thus, the flame from the nozzle of the burner 60 is projected into the heating chamber 81 of the fire box defined by the refractory walls 77 and 80. Thus, some of the heat generated by the flame in the fire box or combustion chamber 81 is transmitted through the walls 74, 77 and 80 to the warm air distributing chamber 72.

However, most of the gaseous products of combustion are forced rearwardly, due to the blower 57 associated with the burner 60, and caused to travel in the direction of the arrows in Figure 6 into the heating chamber 82 and past the baffle plates 83, 84. A horseshoe shaped radiator 90 surmounts that portion of the housing 74 defining the heating chamber 82, this radiator 90 being in the form of a rectangular tube in longitudinal cross-section and held in spaced relation from the outer surface of the housing 74 by a plurality of circularly spaced spacing members or radiator supports 91 disposed adjacent the front end of the radiator 90, there being three of the spacing members 91 shown in Figure 4.

The radiator 90 may entirely encircle the heating chamber 82, however, it is preferable that the lower portion thereof is cut away whereby the radiator extends through an arc of approximately two-hundred seventy degrees. The radiator 90 may be of welded construction and the remote ends thereof are closed as at 93 and 94.

Suitable legs 95 and 96 support the respective front and rear ends of the housing 74, having the chambers 81 and 82 therein, in spaced relation above the bottom wall 12 of the casing 10 and it will be observed in Figures 4, 5 and 6 that the outer wall of the radiator 90 is spaced inwardly from the top wall 11 and the side walls 14 and 15 of the casing 10. The rear portion of the radiator 90 is supported in proper spaced relation to the portion of the housing 74 defining the heating chamber 82 by means of heat exchange pipes 95 which establish communication between the rear end of the heating chamber 82, at points between the baffle plate 84 therein and the rear wall 76 thereof, and the interior of the curved tubular radiator 90, there being three of the pipes 95 shown in Figures 3 to 6, inclusive.

The outer wall of the curved tubular radiator 90 has a pair of diametrically opposed tubular thimbles 97, 100 connected thereto and communicating with the interior of the radiator 90.

The thimble 97 extends outwardly through the side wall 14 and is closed by a removable flanged plate 101 which fits therein and to which the thermostatic stack switch 62 is suitably secured. The thermostatic stack switch 62 has a heat responsive thermal element 103 extending therefrom and penetrating the closure plate 101, the inner end thereof terminating in the circular plane of the radiator 90.

The thermal element 103 may be of conventional construction and is provided for the well known purpose of controlling the thermostatic stack switch 62 to energize the blower motor 46 after the burner 60 has heated the air in the radiator 90 to a predetermined temperature.

Accordingly, a detailed description and illustration thereof is deemed unnecessary. The thimble 100 extends outwardly through the side wall 15 of the casing 10 and has one end of a suitable stack 104 connected thereto. Now, if so desired, the stack 104 may be mounted on either of the tubular thimbles 97 or 100 and, of course, when the stack 104 is mounted on the thimble 97, the closure plate 101 with the thermostatic stack switch 62 and the thermal responsive element 103 may be mounted on the outer end of the tubular thimble 100.

The refractory wall 77 of the combustion chamber 81 and the cylindrical wall 73 of the housing 74 are provided with coinciding openings 106 (Figure 6) and the inner end of a horizontally disposed tubular access member 107 is connected to the cylindrical wall 74 for communication with the openings 106. The tubular access member 107 extends outwardly and penetrates the side wall 14 and is closed by a removable flanged closure member 110 which has a peep opening 111 therein (Figure 1) and which is normally closed by a pivoted pendulum type lid 112 pivotally supported, as at 113, on the access member closure plate 110.

It will be best observed in Figure 4 that the inner surfaces of the top wall 11 and the side walls 14 and 15 defining the air distributing chamber 72 have suitable heat insulating panels 114, 115, and 116, respectively, spaced inwardly therefrom and whose opposite longitudinal edges are bent inwardly and then flanged outwardly, as at 117, the flanges 117 being tack-welded or otherwise secured to the corresponding walls 11, 14 and 15 in order to space the panels 114, 115 and 116 therefrom.

It is thus seen that the blower 57 causes the gaseous products of combustion to move from the nozzle 60 in the combustion chamber 81 rearwardly or toward the blower B. As the gases move toward the rear wall 76 of the heating chamber 82, the baffle plates 83, 84 offer resistance to the movement of the gases with the result that a substantial proportion of the heat is transmitted to the portion of the cylindrical wall 73 defining the heating chamber 82 and radiates therefrom into the air distribution chamber 72. However, the heated gases, which have been cooled somewhat due to radiation through the wall 73 defining the heating chamber 82, pass through the pipes 95 into the radiator 90 and the heated gases are further cooled as the heat is transmitted through the walls of the radiator 90 to heat the air in the air distribution chamber 72. The gases created by the combustion of fuel in the burner 60 are then discharged through the tubular thimble 100 and the stack 104.

Now, as the air around the housing 74 and the radiator 90 is heated, the blower B is running and draws air through the intake opening 18, through the filters 68 and 69 and forces the same into and through the air distribution chamber 72 and thus into the duct system 21 and is thus forced into the various rooms of the house. Since the radiator 90 is spaced from the portion of the wall 73 defining the heating chamber 82 and is also spaced inwardly from the walls of the casing 10, it is thus seen that the air circulated by the blower B moves past the outer surfaces of the housing 74 and the outer and inner walls of the radiator 90 thereby insuring efficient distribution of the air around the combustion chamber 81 and the heating chamber 82.

It is thus seen that I have provided a warm air circulating furnace wherein the heating chamber and the combustion chamber are axially alined horizontally and wherein the radiator surmounts the heating chamber 82 thereby providing a compact heating unit which may be installed in a minimum of space, such as between the main floor F and the surface of the earth in a relatively shallow excavated area beneath the floor or which may be suspended from the ceiling of a basement and will leave sufficient space therebeneath for storage and for persons who may be in the basement or cellar of the house.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A warm air furnace comprising a horizontally elongated tubular casing provided with an air inlet opening at one end thereof and an air discharge opening at the other end thereof, a horizontally elongated cylindrical housing disposed within said casing and spaced from all of the side walls of said casing, said housing having a combustion chamber therein adjacent the air discharge opening, said housing also having a heating chamber therein communicating with the combustion chamber and being disposed in that end of the housing remote from the air discharge opening, at least a pair of spaced overlapping segmental baffle plates secured to and extending alternately inwardly from the opposite lateral sides of said heating chamber, each of said baffle plates extending through an arc of more than 180 degrees at its juncture with the wall of said heating chamber, each of said baffle plates having a portion spaced from the wall of the heating chamber, said baffle plates being overlapped a greater amount at their upper portions than at their lower portions to form a sinuous passageway adjacent the bottom of said heating chamber, burner means extending into the combustion chamber to produce hot gases of combustion which move into the heating chamber, said baffle plates retarding the movement of said gases and blower means disposed adjacent the air inlet opening for moving the air to be heated past the exterior of said housing and through the air discharge opening in substantially the opposite direction from that in which the gases produced by said burner move within the housing.

2. A warm air furnace comprising a horizontally extending cylindrical housing having a combustion chamber in one end and a heating chamber in the other end communicatively connected with the combustion chamber, at least a pair of spaced overlapping segmental baffle plates secured to and extending alternately inwardly from the opposite lateral sides of said heating chamber, each of said baffle plates extending through an arc of more than 180 degrees at its juncture with the wall of said heating chamber, each of said baffle plates having a portion spaced from the wall of the heating chamber, said baffle plates being overlapped a greater amount at their upper portions than at their lower portions to form a sinuous passageway adjacent the bottom of said heating chamber, burner means extending into said combustion chamber to produce hot gases of combustion which are retarded by the baffle plates as they move into the heating chamber, exhaust means for said gases at the end of the heating chamber remote from the combustion chamber and a blower disposed exteriorly of said housing at the end of the heating chamber remote from the combustion chamber for blowing air to be heated around the housing in a direction opposite to the direction of movement of the hot gases within said housing.

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