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HEATER.

APPLICATION FILED FEB. 26, 1910.

987,382.

Patented Mar. 21, 1911.

3 SHEETS-SHEET 1.

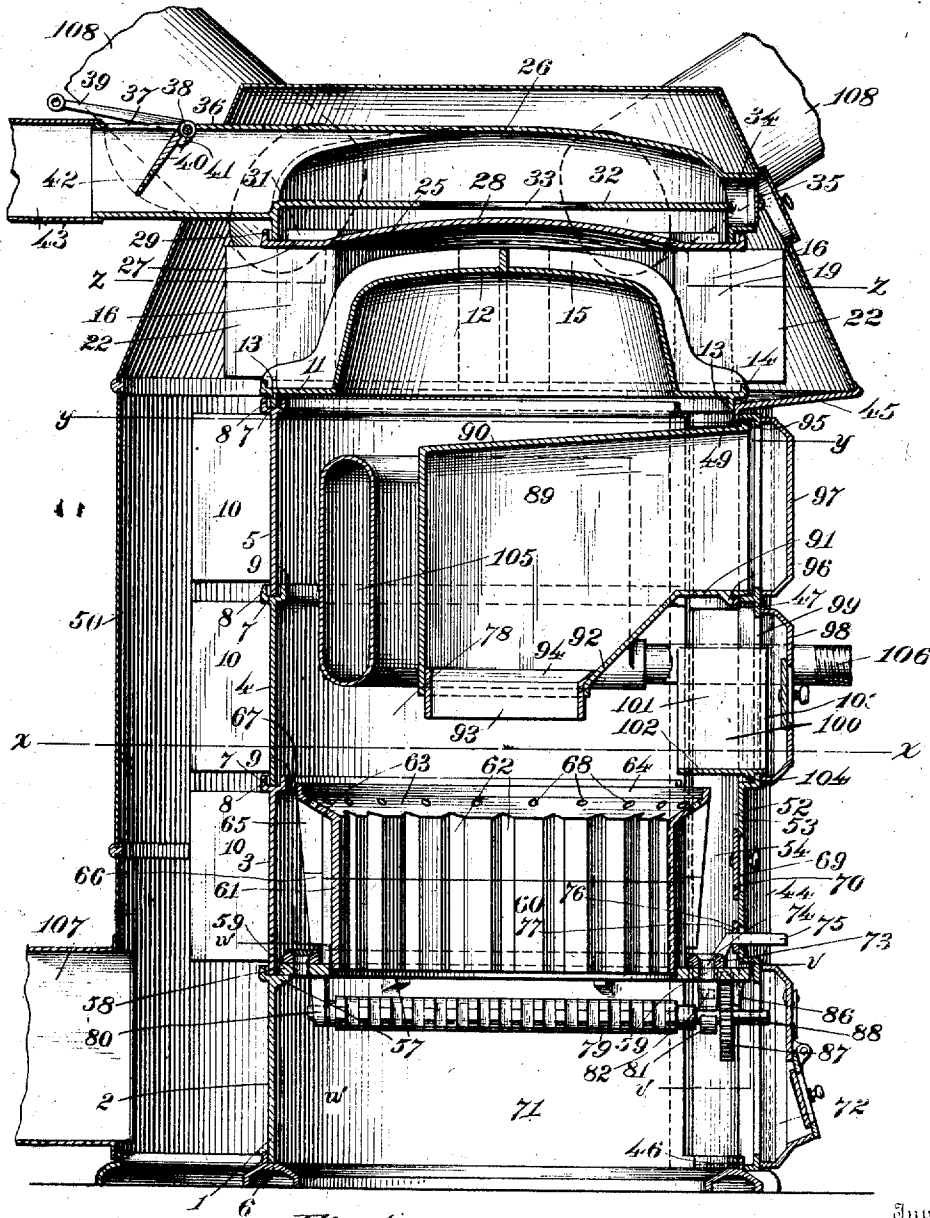


Fig. 1.

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Witnesses

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3 SHEETS-SHEET 2.

Fig. 2.

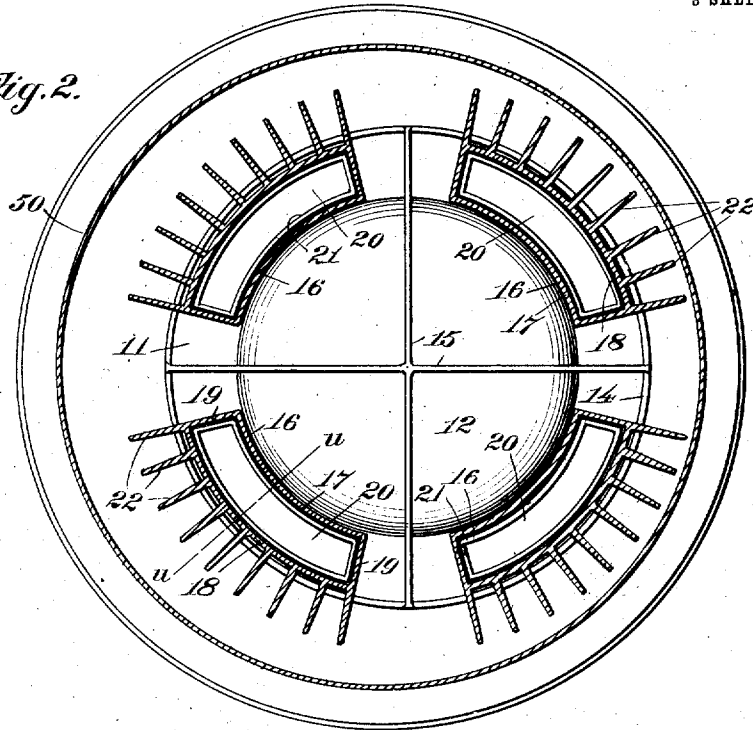


Fig. 6.

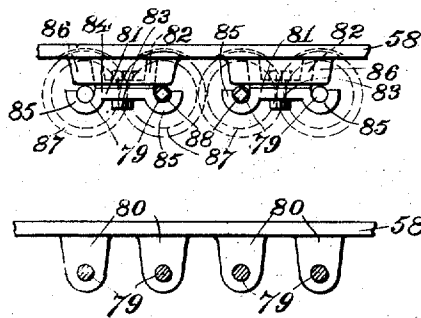
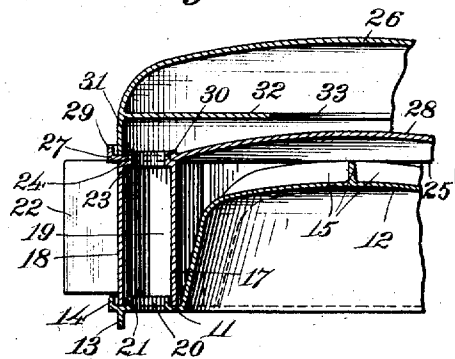


Fig. 7.

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Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 3.

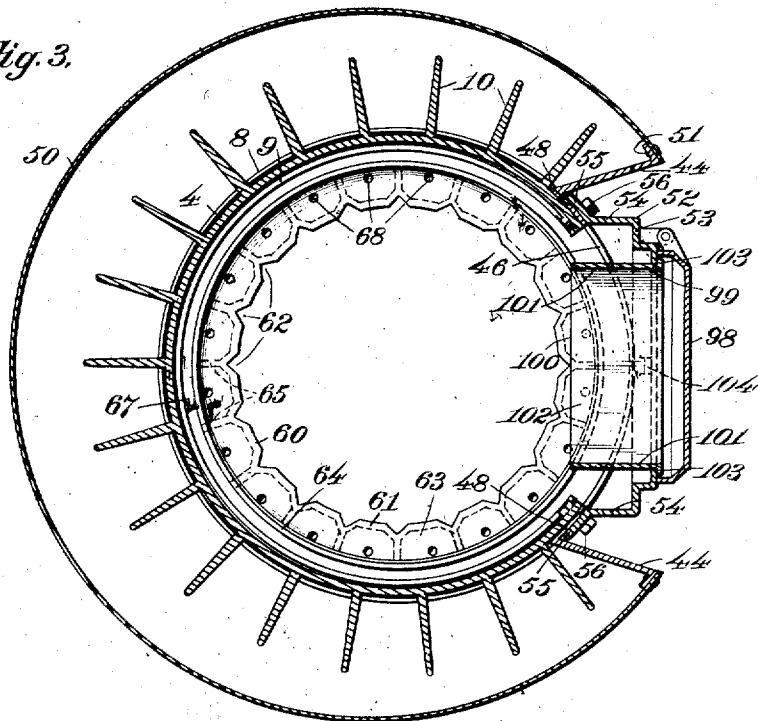
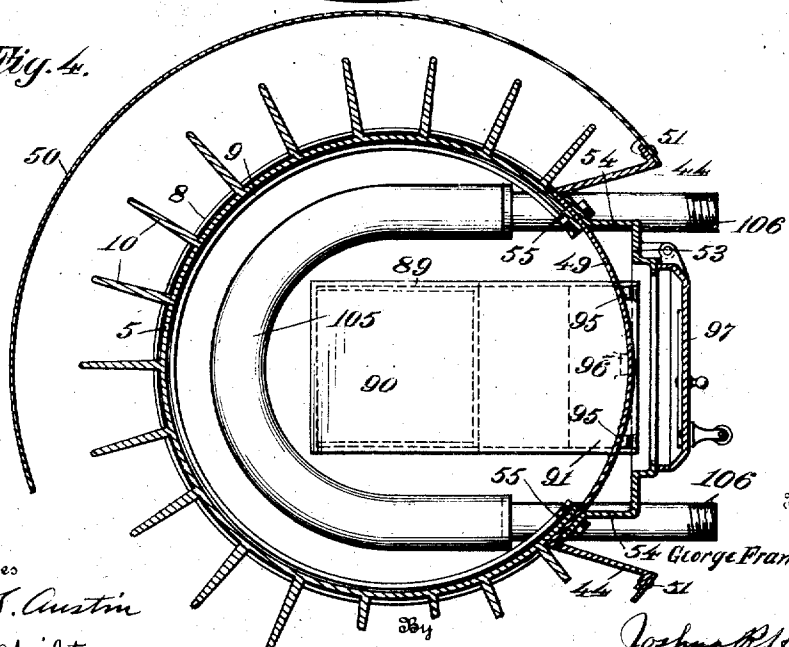


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE FRANK. LIDY, OF WAYNESBORO, PENNSYLVANIA.

HEATER.

987,382.

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Application filed February 26, 1910. Serial No. 546,122.

To all whom it may concern:

Be it known that I, GEORGE FRANKLIN LIDY, a citizen of the United States, residing at Waynesboro, county of Franklin, and State of Pennsylvania, have invented certain new and useful Improvements in Heaters, of which the following is a specification.

My invention relates to heaters and particularly to that class thereof known as hot air furnaces.

The object of my invention is to provide an improved furnace whereby the maximum amount of heat may be obtained and utilized from the amount of fuel consumed.

A further object of my invention is to provide a furnace equipped with improved and regulable means for admitting fresh air to the combustion chamber directly above the coal to insure a substantially perfect combustion of the gases.

A further object of my invention is to provide a furnace equipped with means for admitting sufficient air to the fire pot and combustion chamber to insure substantially perfect combustion of the fuel and gases, and so arranged that the air may be supplied in the desired quantities to the fire pot and combustion chamber.

A further object of my invention is to provide a furnace as mentioned provided with means whereby communication may be established between the ash pit and the combustion chamber and flue while shaking the fire to avoid the ashes escaping from the furnace.

A further object of my invention is to provide a furnace of small size with a maximum radiating surface.

A still further object of my invention is to provide a furnace of improved construction whereby swirling or cycloning of the air between the drum and the jacket is prevented.

Further objects of my invention are to provide a furnace which may be easily and quickly set up from castings direct from the foundry; that is which require no tooling after having been cast; to provide a hot air furnace with a fuel magazine, thereby forming a self feeding furnace; and to provide a furnace having a removable front whereby the fuel magazine, the fire pot, the grate and other part of the interior of the furnace are readily accessible for the purpose of assembling, removal or repair without dismantling the furnace.

Further objects of my invention are to provide a fire pot of improved construction; and to provide improved means for supporting and operating the grate bars whereby either side of the fire may be shaken down as desired or needed without disturbing the opposite side.

A further object of my invention is to provide a furnace with an improved flue and damper for the same, said flue serving as a smoke flue and as a ventilator for the furnace room.

A further object of my invention is to provide a flue for a furnace whereby a constant draft may be maintained in the chimney and the draft of the furnace regulated at will.

A further object of my invention is to provide a flue for a furnace equipped with a damper which shall automatically operate to relieve the furnace of pressure in case of explosion of gases within the same.

A further object of my invention is to provide a combination hot air and hot water heater of improved construction.

Other objects will appear hereinafter.

With these objects in view my invention consists generally in a furnace comprising a radiating drum formed of a plurality of similar superimposed sections and an upper radiating drum head, a chamber supported above said drum head, a flue extending from said chamber, passage ways connecting the interior of the radiating drum and said chamber and a jacket surrounding the same and provided with a cold air inlet and a plurality of hot air pipes extending from the upper end thereof. The front of the several sections of the radiating drum are cut away and secured to the edges of the cut away portion is a front frame which connects the drum and the casing at this point, said casing being also cut away or discontinued across the front of the furnace. To the front frame is secured the front casting which is detachably held in position by a plurality of bolts. Each section of the drum is provided on its upper edge with an ample groove to receive the lower edge of the section directly above and all of said sections, with the exception of the lowermost, are provided with a plurality of radiating vanes or plates formed integrally therewith. The lower section of the drum is provided with a plurality of inwardly projecting lugs upon which rests a fire box ring and resting upon

the inner edge of said ring is the fire pot. The fire pot is formed with substantially vertical walls which are outwardly flared at the top and the outwardly flared portion is provided with a plurality of apertures and is of such size as to leave a passage way between its outer edge and the adjacent wall of the drum. Resting upon the fire pot ring and encircling the fire pot is a movable ring having a plurality of apertures which in one position are adapted to register with similar apertures in the first said ring. The upper head of the radiating drum is bell or dome shape and formed with a plurality of ribs to increase its radiating surface. The radiating drum above the fire pot comprises the combustion chamber, and within said chamber is removably supported a fuel magazine having a discharge opening directly above the center of the fire pot. Resting upon the drum head are a plurality of flue castings which support the flue or smoke chamber, said head and the bottom wall of said chamber being provided with suitable apertures communicating therewith and said chamber is provided with an annular baffle plate to maintain the hot products of combustion in contact with the lower radiating wall thereof. The flue leading from said chamber is provided with an aperture and equipped with a damper which is adapted when in one position to close or partially close the flue and in another position to close said aperture.

My invention further consists in the furnace as above mentioned and in the various arrangements and combinations of parts all as will be fully described hereinafter and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings forming a part of this specification and in which—

Figure 1 is a vertical section of a furnace embodying my invention in its preferred form, Fig. 2 is a horizontal section of the same taken on the line $z-z$ of Fig. 1, Fig. 3 is a horizontal section taken on the line $x-x$ of Fig. 1, Fig. 4 is a similar view taken on the line $y-y$ of Fig. 1, Fig. 5 is a detail vertical section taken on substantially the line $u-u$ of Fig. 2, Fig. 6 is a detail view illustrating the manner of supporting the front ends of the grate bars and taken on substantially the line $v-v$ of Fig. 1, and Fig. 7, is a similar view illustrating the manner of supporting the rear ends of the grate bars and taken on the line $w-w$ of Fig. 1.

Referring now to the drawings 1 indicates the radiator drum which consists of a plurality of superimposed members or castings 2, 3, 4 and 5. The lower member 2 rests upon a base ring 6 and supports the fire pot and the grate as will be fully described hereinafter. The members 3, 4 and 5 are of

similar construction and any desired number thereof may be employed, the height of the furnace depending upon the number of sections or members used. Usually three sections give the best results and I have so illustrated it in the drawing. Each section of the drum is provided with a flat face or seat 7 on its upper edge upon which rests the lower edge of the superimposed section and the outer edge of said seat is provided with an upturned annular flange 8 between which and the walls of the sections is placed sand or cement to make a tight joint. The inner edge of the seat on the sections 3, 4 and 5 is provided with an inner upturned flange 9, the flanges 8 and 9 forming a groove to receive the lower edge of the section next above. The sections 3, 4 and 5 are also provided with a plurality of flat vertically disposed radial vanes or wings 10, which are preferably cast integrally therewith and increase the radiating surface of the drum.

The drum head or dome comprises a flat annular portion 11 and a bell shaped central portion 12 preferably cast in one piece, and the portion 11 is provided with a depending annular flange 13 which rests in the groove formed by the flanges 8 and 9 on the top section 5 of the drum. The portion 11 is also formed with an upwardly extending peripheral flange 14. Extending from side to side of the drum head, are a pair of vertically disposed ribs or flanges 15 arranged at right angles to each other and dividing the upper face of the head into four sections or segments. The ribs or flanges 15 also serve to increase the radiating area of the drum as well as to strengthen the drum head.

Resting upon the flat horizontal portion 11 of the drum head are a plurality of flue members or smoke tubes 16 each preferably formed of a single casting. Each smoke tube 16 is formed of an inner and outer curved wall 17 and 18 respectively which conform to the curvature of the portion 11, and a pair of straight end walls 19. The portion 11 of the drum head is provided with apertures 20 corresponding to the smoke tubes and defined by upwardly extending flanges 21 which extend into the lower end of said tubes to position the same. The outer wall 18 of each tube is provided with a plurality of radial vanes or wings 22 similar to the wings 10. The upper ends of the smoke tubes are formed with peripheral flanges 23 which extend horizontally inwardly a short distance forming seats or rests 24 to receive and support the smoke or flue chamber.

The smoke or flue chamber is formed of two castings, a lower casting 25 and an upper casting 26. The lower casting consists of a flat peripheral portion 27, corresponding to the portion 11 of the

drum head, and a central portion 28 which is preferably curved upwardly to arch over the bell shaped central portion of the drum head forming a free passage way between them for the air as will be fully described hereinafter. The member 25 is formed with a peripheral annular flange 29 and provided with apertures 30 in the portion 27 to receive the upper ends of the smoke tubes which consist of the upwardly extending flange 31 defining the inner edge of the seats or rests 24 upon which the portion 27 rests. The upper member or casting 26 comprises a shallow bell shaped member, the lower edge of which rests upon the lower casting 25 just within the peripheral flange 29, and is provided with a horizontal annular baffle plate 32 which maintains the hot smoke and gases in contact with the lower casting 25 as they issue from the smoke tubes. The baffle plate is provided with a centrally disposed aperture 33 forming a means of communication between the lower and upper portions of the smoke or flue chamber. The side of the casting 26 is provided with a clean-out opening 34 having a closure 35. The opening 34 is arranged partially above and partially below the plate 32 in order to give access to the chamber both above and below the baffle.

Extending from one side of the smoke or flue chamber and above the baffle plate is a smoke flue 36 which is cast integrally therewith. The flue 36 is preferably rectangular in cross section and is provided with an opening 37 in its upper face or wall. Rotatably mounted across said opening, and preferably at the side adjacent the furnace is a rod 38 having an arm 39 for operating the same. Loosely mounted on said rod is a plate or damper 40 which is adapted in one position to substantially close the flue and in another position to close the aperture or opening 37. Fixed to the rod 38 is a lug or lugs 41 which is adapted to engage the plate or damper 40 when the arm 39 is raised to raise said damper. It is obvious that with this construction the damper may be normally held in any desired position and serves as a safety valve to relieve the pressure within the furnace in case of explosion of gases therein. The damper is provided with a small opening 42 which permits sufficient draft to carry off superfluous gases from the furnace even though the damper is in closed position. The opening 37 in the flue serves to ventilate the furnace room and also to maintain a constant draft in the chimney irrespective of whether the damper 40 is opened or closed.

43 indicates the stove pipe leading from the end of the flue 36.

The front of the furnace is provided with a front frame formed of a single casting and comprising the vertical side members

44, a top member 45, a bottom member 46 and a horizontal intermediate member 47. The front frame is substantially co-extensive in height with the drum shell, that is, substantially the same height as the members 2, 3, 4 and 5. The radiator drum shell members 2 to 5 inclusive, are preferably circular in form, but are not complete cylinders, the front portions being cut away or omitted for the width of the front frame, and the ends of said members are secured to said front frame. To facilitate attaching the front frame to the drum shell members the sides 44 of the frame are provided with inturned flanges 48. The top 45 of the frame is provided on its inner edge with a depending flange 49, which, together with the flanges 48 and the portions 46 and 47, are curved to complete the circular or cylindrical shape of the radiator drum. The sides 44 of the frame are preferably outwardly flared and to their outer edges, is secured the jacket 50, the outer edges being flanged as at 51 for this purpose.

Detachably secured to the front frame is a removable front 52 which comprises a preferably flat vertical plate 53 having sides 54 extending inwardly at right angles thereto and provided at their inner edges with out turned flanges 55 which are perforated to receive the attaching bolts 56. By removing the nuts on the bolts the front may be readily removed to give access to the interior of the furnace.

The lower member 2 of the radiator drum comprises the ash pit of the furnace, and is provided adjacent its upper edge with a plurality of inwardly extending lugs 57. Resting upon the lugs 57 is a fire pot ring 58 which is provided with a plurality of apertures 59. Resting upon the inner edge of the ring 58 is the fire pot 60. This is formed with vertical walls 61 having vertical angular corrugations 62 formed therein. The walls 61 extend upwardly almost to the top of the fire pot, are then flared outwardly and upwardly as at 63 terminating in an upwardly extending rim 64. Extending radially outwardly from directly behind each of the corrugations 62 is a web or radiating vane 65. The fire pot is preferably cast in two sections adapted to rest one upon the other. The line separating the sections of the vanes is in a plane above the line separating the sections of the wall 61 so that the upwardly projecting ends 66 of the lower portions of the vanes lock the sections against relative displacement. The upper edge or rim 64 of the fire pot is smaller in diameter than the shell of the drum leaving an annular passage way 67 between them. The outwardly flared portion 63 of the fire pot is provided with a plurality of perforations 68 which admit fresh air to the fire directly above the coal and where necessary

for the complete combustion of the gases. The perforations 68 are arranged directly above the passages formed between the radiating vanes 65 hence the air is heated before it reaches the fire.

Fresh air is admitted about the fire pot through the apertures 59 in the ring 58 and also through draft openings 69 in the front casting directly opposite the grate as shown in Fig. 1. The draft openings 69 are controlled by a slide 70 by means of which the air therethrough may be regulated or entirely cut off. Air is admitted to the ash pit 71 beneath the ring 58 through the ash pit door 72 and means are provided for directing the air in the ash pit through the fire pot or about the same. To this end a slidable ring 73 is provided which rests upon the ring 58 and encircles the lower end of the fire pot, the lower ends of the vanes 65 being cut away as shown to accommodate the same. The ring 73 is provided with a plurality of apertures 74 adapted in one position to register with the apertures 59 and in another position to close the same. 75 indicates a handle formed on the ring 73 and projecting through a slot 76 in the front 52 of the furnace and by means of which the ring may be turned as desired. A slide 77 is provided on said handle to close the slot 76. In starting the fire and when it is desired to cause the fuel to burn more freely the ring is turned to close the apertures 59, thereby causing all of the air to pass through the fire pot. At other times the ring is turned to open the apertures, admitting the air to the combustion chamber 78 above the fire pot where it is utilized to consume the products of combustion. The air will pass freely through the apertures in the ring, the apertures 68 and the passage way 67 instead of through the fire as it will follow the path of least resistance.

79 indicates the grate bars of which I preferably employ four mounted in pairs as shown in Figs. 6 and 7. The rear ends of the grate bars are mounted in depending lugs 80 preferably formed integrally with the ring 58. The forward ends of the bars are supported by detachable members 81 to facilitate readily removing the same when necessary. To this end a pair of depending brackets 82 are formed on the ring 58, one being provided for each pair of grate bars and the members 81 are detachably secured thereto by bolts 83. The members 81 each comprises a straight horizontal portion 84 and a pair of bearings 85 formed at the ends thereof as shown in Fig. 6. To maintain the grate bars in the bearings 85 depending lugs 86 are formed on the ring 58 in front of the brackets 82. See Figs. 1 and 6. Fixed to the grate bars and arranged between the brackets 82 and lugs 86 are intermeshing gears 87, that is the gears of each pair of

grate bars intermesh, but one pair is arranged slightly in advance of the other pair of gears in order that the fire on one side may be shaken down without disturbing the fire on the other side. The two inner grate bars are extended forwardly and squared as at 88 to receive the shaker. When shaking down the fire the ring 73 is turned until its apertures 74 register with the apertures 59. The dust and ashes then pass upwardly through said apertures, the passage way 67, the combustion chamber and the smoke tubes 16 to the smoke or flue chamber and flue.

Removably supported within the combustion chamber 78 is a coal magazine 89 which is formed preferably of a rectangular casting comprising a body portion 90 a feed extension 91 and a hopper bottom 92 the discharge opening in which is directly over the center of the fire pot. The lower end of the hopper bottom is provided with an extension 93 having a flared upper end adapted to rest upon and within the inclined walls of the bottom as shown in Fig. 1. As the extension is exposed to the intense heat of the fire it is liable to become burned in time and may be readily removed and replaced by another. The forward end of the extension 91 fits between the horizontal portions 49 and 47 of the front frame and the outer face of the top wall thereof is provided with a pair of lugs 95 which bear against the outer face of the member 49 and shown clearly in Fig. 4. The lower wall of the extension is provided with a lug 96 which bears against the inner face of the member 47. By raising the inner end or body of the magazine until the lower edge of the extension 91 passes the member 47 the magazine may be readily removed.

The front of the furnace is provided with a feed door 97 directly in front of the feed extension 91 of the magazine and with a door 98 below the same and above the level of the top of the fire pot giving access thereto for kindling the fire and other obvious purposes. The door way 99 of the door 98 is provided with a shield 100 which extends inwardly to overhang the adjacent portion of the fire pot and prevent fuel from dropping between the fire pot and the front of the furnace. The shield is made to fit the door opening and comprises a pair of side walls 101 and a bottom wall 102. The outer edges of the walls 101 are provided with flanges 103 which engage the front of the furnace at the side of the opening 99 and the lower or bottom wall 102 is provided with a lug 104 adapted to impinge against the inner face of the front beneath the door opening. It is obvious that by raising the member 100 until the lug 104 is above the bottom of the opening 99 it may be readily removed.

Arranged within the combustion chamber

and partially surrounding the fuel magazine is a hollow casting 105 forming the boiler of a water heater when it is desired to use the furnace as a combination hot air and hot water heater. 106 indicates the pipes leading to and from the member 105. The member 105 is substantially semi-circular or horse shoe shape and is arranged where it will receive a great amount of heat from the fire and yet is removed from the fire pot so that cold water therein will not deaden the fire.

The jacket 50 is provided with a cold air duct or inlet 107 and its upper end is provided with the hot air pipes 108 leading to the several rooms of the building.

The furnace above described is of great heating capacity in proportion to its size and the amount of fuel consumed. This is obvious when the great radiating surfaces of the drum, the drum head, the smoke pipes and the flue chamber are taken into consideration. The cold air entering the furnace through the inlet 107 passes upwardly between the vanes 10 to the top of the drum and there part of the air passes on upwardly while part of the air passes in between the drum head and the bottom of the smoke or flue chamber. The large size of the combustion chamber also, gives ample opportunity for comparatively all of the products of combustion to be consumed before passing into the flue, thus obtaining a large percentage of heat from the fuel.

The simplicity of the furnace and the comparatively low cost at which the same may be manufactured and set up should be noted.

The whole furnace is composed of castings as they come direct from the foundry, no tooling or jointing being required with the exception of the holes for the hinge pins of the doors. It is assembled by merely building or laying one part upon the other in order and the only bolts or other fastenings required are those for the members 81 which support the forward ends of the grate bars and the bolts and fastenings for securing the front frame and the front in position.

The furnace may be readily kept clean and the entire interior is readily accessible

by merely removing the front casting without dismantling the furnace.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a furnace, a radiator drum open at the front, a channel in the upper edge of said drum co-extensive with the length of said upper edge, a drum head having a depending continuous circular flange resting in said channel, a front frame secured to the front edges of said drum, said front frame having a transverse member at the top fitting against the portion of said depending flange between the ends of said channel, and a front secured to said frame, substantially as described.

2. In a furnace a radiator drum and a head for the same, in combination with a plurality of smoke tubes resting on said head and extending upwardly therefrom near the periphery thereof, a smoke chamber resting upon the upper ends of said tubes, said tubes opening into said chamber, an annular baffle plate in said chamber projecting across the upper ends of said tubes, the side of said chamber being provided with a clean-out opening extending above and below said baffle plate, a closure for said opening, and a flue leading from said chamber above said plate, substantially as described.

3. In a furnace a drum and a front frame, said front frame being provided with a feed opening, in combination with a coal magazine arranged within said drum and having a feed extension adapted to fit within said feed opening, a pair of lugs on the upper face of said extension adapted to engage the outer face of said frame above said opening and a lug on the under face of said extension adapted to engage the inner face of said frame below said opening whereby said magazine is detachably supported in position, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE FRANK LIDY.

Witnesses:

ROSE L. PIM,
BERTIE L. LIDY.