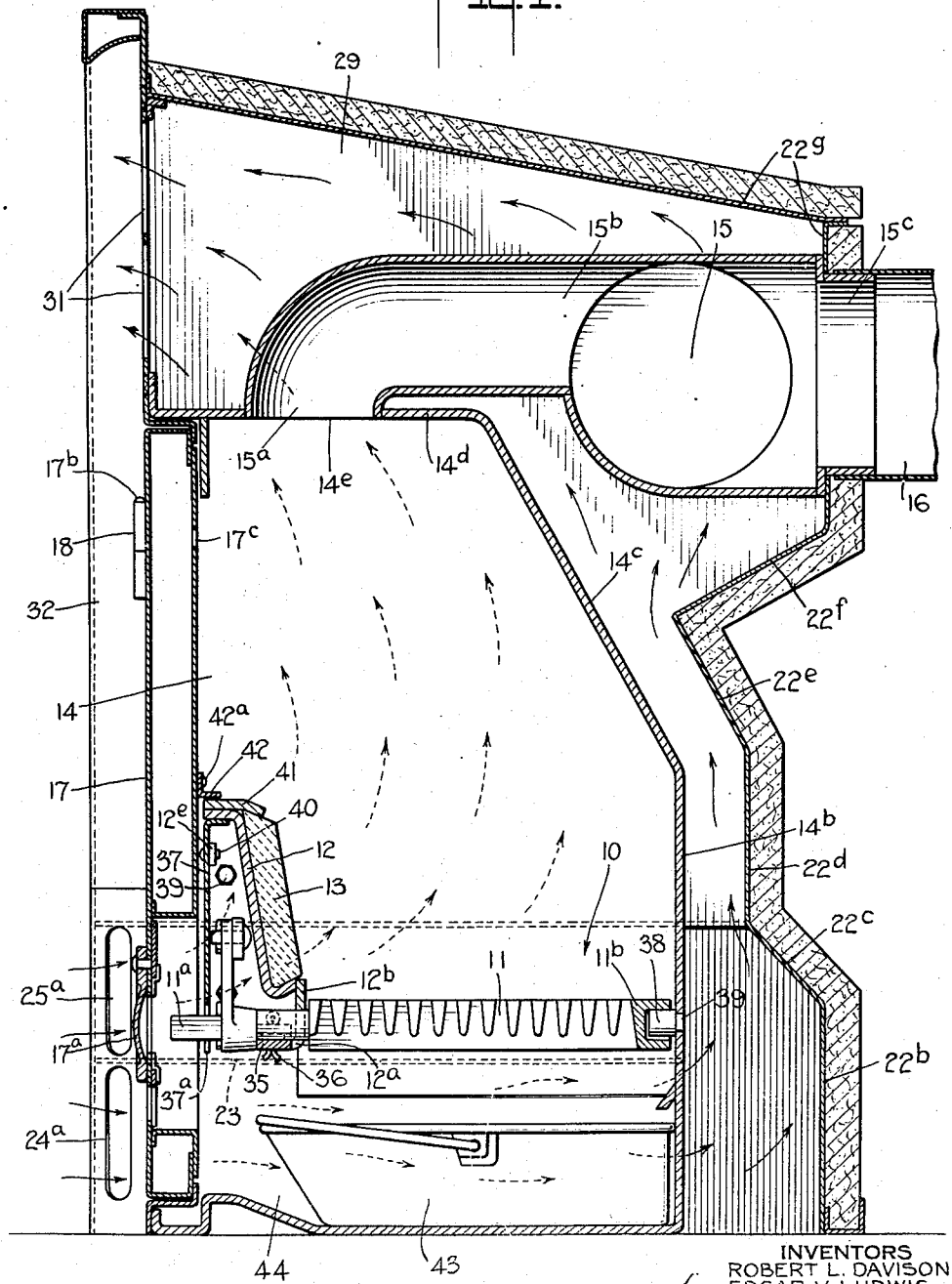
Jan. 14, 1936. R. L. DAVISON ET AL 2,028,088

FIREPLACE STOVE AND HEATER

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Fig. 1.



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Fig. 2.

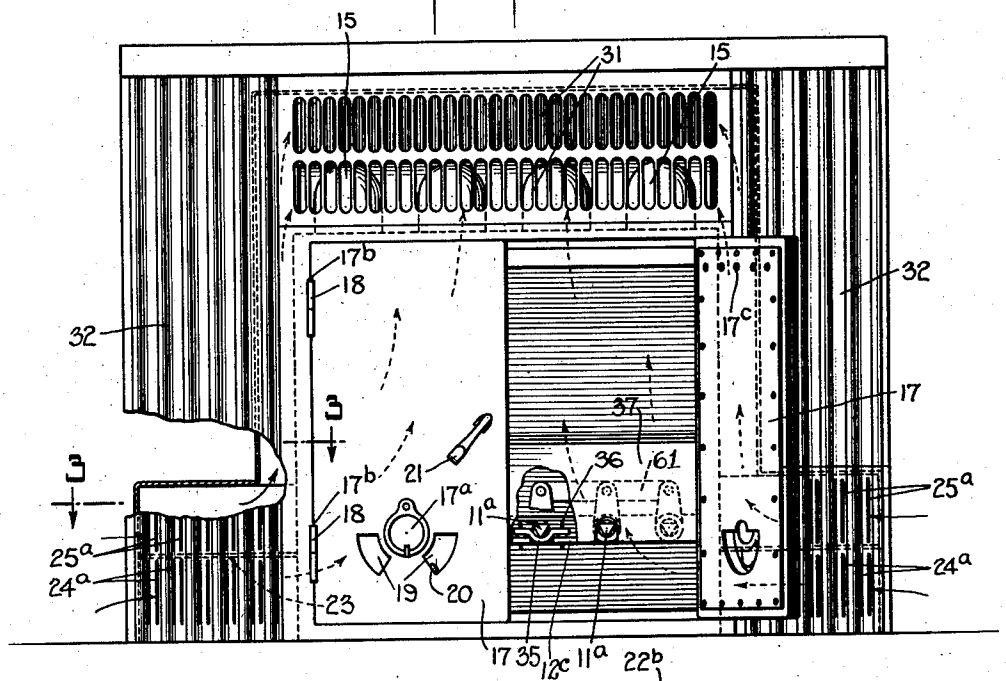
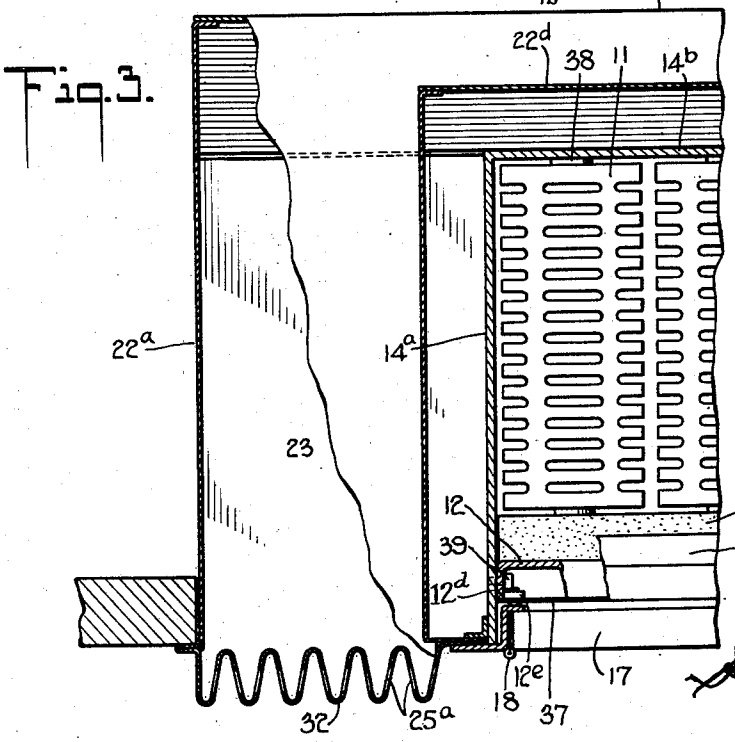


Fig. 3.



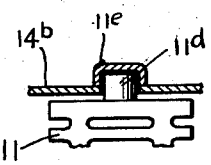


Fig. 8.

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Fig. 4.

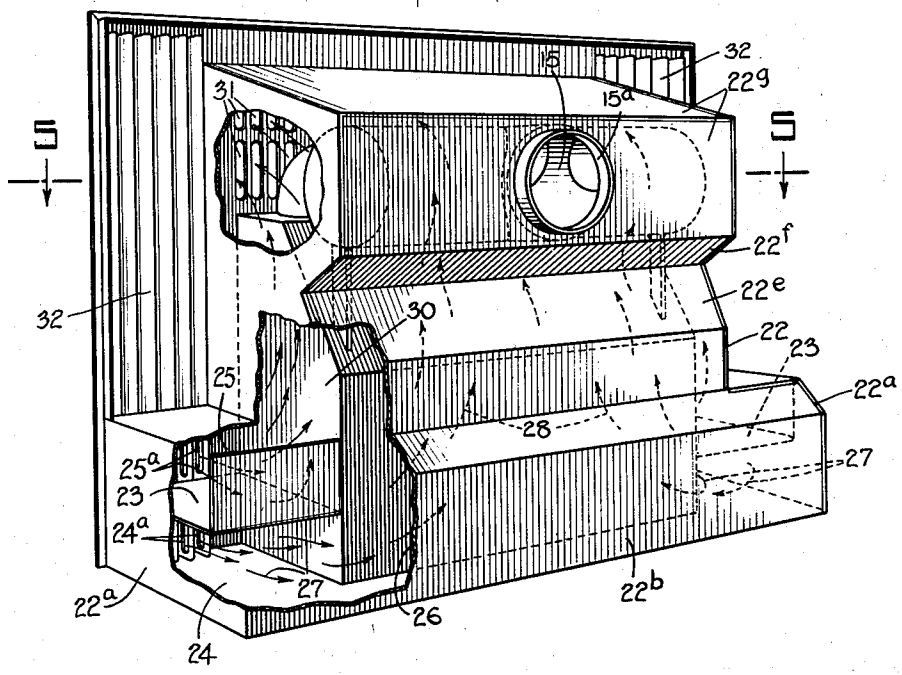
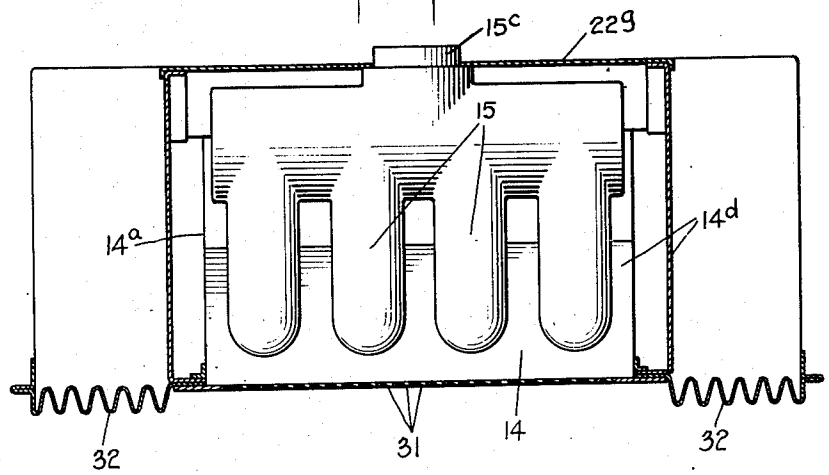


Fig. 5.



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Fig. 6.

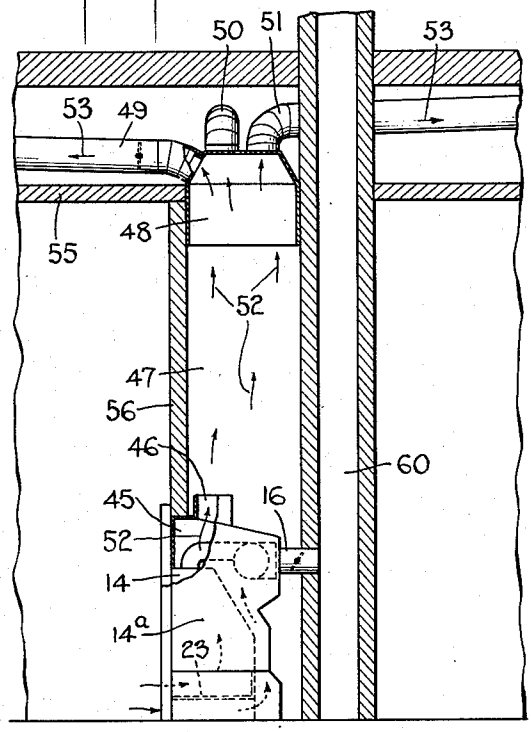
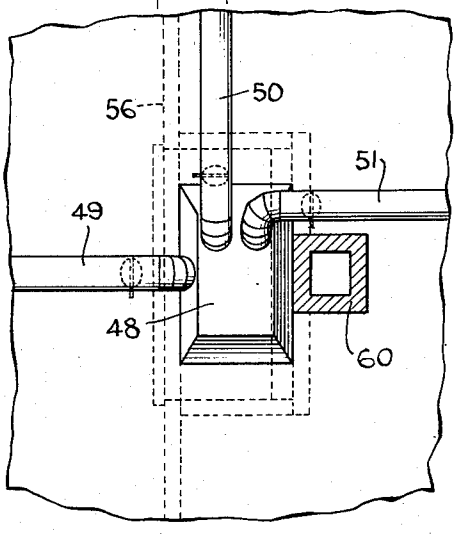


Fig. 7.



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2,028,088

FIREPLACE STOVE AND HEATER

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Application November 5, 1932, Serial No. 641,428

4 Claims. (Cl. 126—121)

The invention relates to improvements in stoves and heaters.

A feature of the invention is its adaptation as a fireplace, and the provision of doors which when in use render the heater of the non-fireplace type.

A feature of the invention is the provision of passages for the flow of air in heated relation to the combustion chamber and particularly relative to the flues for the discharge of the hot products of combustion, whereby the room or compartment is elevated in temperature by combined radiant and convection distribution.

A particular feature of the invention is the provision of a plurality of passages taking in air through ducts on opposite sides of the combustion chamber, one of said passages on each side affording heating of the air by contact with a lateral wall of the combustion chamber, another of said passages affording heating at the rear wall of the combustion chamber, and a collecting chamber for the merging of the thus separately heated air flows.

More particularly, the invention relates to a stove or heater comprising essentially a combustion chamber including a fire box suitable for coal or other fuel, flue passages conveying the heated products of combustion from the combustion chamber, such flue passages in whole or in substantial portion thereof being enclosed in a casing, which casing in turn encloses the combustion chamber, such casing providing for the flow and heating of separate air currents, one air flow being in heating engagement and about the exterior faces of the lateral and upper walls of the combustion chamber, the other air flow being about the exterior faces of the rear and upper walls of the combustion chamber, the air thus heated by and through the separate passages being merged and discharged above the combustion chamber.

Preferably, a plurality of flues and a collecting flue is provided for the discharge of the hot products of combustion and located in the heated air collecting chamber, for superheating the merged air flow before discharge from the collecting chamber.

Most effectively, provision is made for the conjoint air flow from opposite sides of the combustion chamber, the inflow for the two air flows being provided at the opposite sides of the combustion chamber by ducts disposed in vertically superposed relation.

Desirably, the combustion chamber is constructed to have a restricted area toward its top, as by converging the rear wall of the combustion chamber toward the front wall. Desirably, also, horizontal flue pipes communicate with the combustion chamber at its top, the flue pipes communicating with a common or collecting flue pipe, all of which are enclosed within the heated air collecting chamber. Desirably, further, the outer casing may have its rear wall of re-entrant or other angular formation, conforming in general substantially to the contour of the converging upper portion of the rear wall of the combustion chamber, to thereby more effectively increase the degree of heating of the thus directed air flow.

The heater may, if desired, serve as a hot air heater for the heating of one or more rooms in addition to the room in which the stove is located, the heating of the additional room or rooms being afforded by piping communicating with the collecting chamber, either directly or through a plenum chamber or other suitable means.

Further features and objects of the invention will be more fully understood from the following detail description and the accompanying drawings, in which

Fig. 1 is a vertical central section of a preferred form of the invention;

Fig. 2 is a front elevation of the embodiment shown in Fig. 1; this figure also illustrates a pair of doors for the front of the combustion chamber, one door being shown in its open position;

Fig. 3 is a detail substantially horizontal sectional view on line 3—3 of Fig. 2;

Fig. 4 is a rear perspective view of the embodiment shown in Fig. 1, portions of the outer casing being broken away to disclose otherwise hidden parts;

Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 4;

Fig. 6 is a side elevation showing an embodiment of the invention in the form of a warm air heater; and

Fig. 7 is a top plan view of Fig. 6;

Fig. 8 is a detail view of a grate bar and mounting for its rear end, in modification of corresponding parts shown in Fig. 3.

Referring to the drawings, which as above stated illustrate a more preferred form of the invention, a conventional fuel bed for solid fuel is indicated at 10; 11 indicates a set of suitable grate bars which may be of the shaking grate bar type or of the stationary bar type, as preferred, 12 the combined coal guard and grate support which may be provided with fire brick 13. Any suitable burner for oil or other liquid

fuel, or any suitable arrangement for gas fuel may be employed.

As illustrated, the opposite side walls 14a of the combustion chamber 14 may extend substantially vertically. The rear wall is preferably of angular formation, and may comprise the lowerly substantially vertically extending portion 14b, and the upper forwardly converging portion 14c; the resulting top wall 14d of the combustion chamber is of materially reduced area.

The top wall 14d is provided with one or more suitable flue openings 14e, through which extend and communicate the corresponding one or more flue pipe sections 15b. Preferably, the flue pipe comprises a plurality of side-by-side flue pipe sections, each having a curved bend terminating in its lower end 15a which communicates with and through an opening 14e; each flue pasage section 15b comprises further a substantially horizontally extending portion 15. The flue pipe sections 15b communicate with a manifold or collective flue having a discharge opening 15c communicating with the stack 16 of the building or other structure.

Desirably, doors are provided for the combustion chamber, to thereby regulate the heat distributed by direct radiation of the ignited fuel. Preferably, the door means comprises a pair of oppositely hinged door sections 17, 17, each shown mounted on a pair of vertically aligned hinges 18, 18. Each door 17 may have a draft damper 19, regulated by slide closure member 20. Each door may be provided with a handle or ring 21. 17a is a shaker handle cover opening.

As above indicated, supplemental heating is provided by separate air flow by passages defining separate paths of flow of the air, the air through the separate passages being heated by contact over predetermined portions of the exterior faces of the walls of the combustion chamber. Most effectively, such separate air flow is had by providing for the inflow of the air through intakes located on opposite sides of the combustion chamber. To facilitate manufacture of the heater as an entirety, the passages for the separate air inflow are constructed as a unit, and the configuration of the unit as a whole is selected for artistic effects, as may be desired.

Such separate inflow passages are a part of or communicate with the outer casing 22, see Fig. 4, which may include laterally extending portions 22a, on opposite sides of the combustion chamber 14. The lateral extensions 22a are of reduced vertical height as compared with the body of the outer casing 22. Vertically intermediate each extension 22a I locate a substantially horizontally extending dividing plate 23 which extends to substantially the rear wall of the combustion chamber, to thereby define in combination with the walls of such extension 22a and a lateral wall of the combustion chamber a lowerly disposed duct 24 having an intake 24a, and further similarly defines an upper duct 25 having an air intake 25a, as appears clearly from Figs. 1, 2 and 4. The respective sets of air intakes 24a, 25a at each of the opposite sides of the combustion chamber may be through grilles, which may be of any suitable formation, for artistic effect and preferably concealing the individual grille openings.

Each lowerly air duct 24 communicates with the rearward air passage 26 formed at a lowerly portion between the lower rear wall 22b and the lower portion 14b of the rear wall of the combustion chamber. Desirably, the upper portion of the rear wall of the outer casing is of angular formation, and as illustrated, comprises the converging wall portion 22c, which merges with the lower wall portion 22b, then extends to the vertical wall portion 22d, then converges forwardly at the portion 22e, which last named wall portion of the rear wall of the outer casing coacts with the forwardly converging rear wall portion 14c of the combustion chamber. The uppermost portion 22f diverges rearwardly to meet the upper and top walls 22g of the outer casing. By such or equivalent arrangement of the stated communicating passages, air is conveyed through the intakes 24a at the respective opposite sides of the combustion chamber, thence flows substantially horizontally as indicated by the arrows 27, thence upwardly in the passage portions between the respective adjacent rear wall portions 14b, 22d, 14c, 22e, and 22f, as indicated by the arrows 28, toward and into the upper warm air collecting chamber 29. As appears from Figs. 1 and 4, the converging of the wall portion 22c relative to the rear wall of the combustion chamber, serves to restrict an area of the resulting air passage, and thereby increase its relative rate of flow. Such increased rate of air flow ensues, it will be observed, at a region of relatively high temperature, engendered by the relatively close proximity of the bed of burning fuel, thereby markedly increasing the rate of exchange of thermal units emitted by the burning fuel to the air flow through the stated region.

Increased exchange of heat energy is also afforded by the stated inwardly inclined wall portion 14c of the combustion chamber and the stated inclination in a like direction of the stated wall portion 22e of the rear air channel.

The upper horizontal inflow air duct 25, at each side, leads to the vertical passage 30, see Fig. 4, which affords heating of the air in contact with a side wall 14a of the combustion chamber; the passage 30 communicates at its upper end with the upper warm air collecting chamber 29, wherein the thus heated air merges with the air fed through the lower intake openings 24a and heated as above described.

The rate of discharge and consequent relative degree of heating of the air may be controlled by a slide or other conventional regulator for the discharge slots 31 of the stated upwardly disposed warm air collecting chamber 29.

For artistic and simplified manufacturing purposes, the set of intake openings 24a, 25a, are formed at lowerly portions of a side plate 32, which may be corrugated or other angular formation as illustrated, the sets of openings 24a, 25a being in the form of vertically extending slots, disposed side-by-side horizontally, each slot being preferably formed in an inner web portion of the side plate for the purpose of concealment.

As appears in Figs. 1, 2 and 3, the plate 12 serves as a fuel guard, preferably in combination with the fire brick 13, thus forming an imperforate wall for the fuel bed toward the front opening of the combustion chamber. Coacting with the plate 12, we provide the angular plate 12b, the vertically extending portion of which directly abuts the lower edge of the plate 12. The horizontally extending portion 12c of the angular plate 12b is provided with downwardly opening recesses 12a coacting with removable arcuate supporting yokes 35, for respectively supporting the front ends 11a of the grate bars 11. Cotter pins 36 passing through suitable openings

at the opposite end portions of each yoke **35** and registering openings in the stated horizontal portion of the angular plate **12***b*, serve to secure the respective yokes **35** in position. The forward ends **11***a* of the grate bars **11** are of any desired polygonal cross-section, and are received within corresponding cross-sectional openings of the conventional linkage **61** interconnecting the grate bars to afford rotation by means of a suitable shaker having also a corresponding cross-sectional opening. The handle of the shaker is passed through the indicated opening in the door **17**; the stated opening is shown provided with a cover plate **17***a*.

By such provision, the linkage **61** is located between the grate **12** and fire brick **13** and the door opening of the combustion chamber, thereby protecting the linkage from excessive heat and as well affording a clear space below the grate bars, as compared with the conventional practice of locating the linkage in the space below the grate bars.

Any grate bar may thus be removed and forwardly withdrawn by uncoupling its yoke **35** to permit the front end of the grate bar to drop, and to thereby afford forward movement and removal from position. Preferably, each grate bar is individually supported at its rear end, as by means of a cylindrical lug **38**, received within an opening **39** in the rear wall **14***b* of the combustion chamber **14**, see Fig. 1, and welded or otherwise secured therein, the rear end portion **11***b* of the grate bar being recessed to receive its lug **38**.

The supporting plate **12** is secured in position by any suitable means, as by the provision of a vertical flange **12***d*, see Fig. 3, at each of its opposite ends, each of which flange **12***d* is suitably retained in position as by means of capped screws **39**. The cover plate **37** is suitably secured in position, as by capped screws **40**, see Fig. 1, tapped into the tapped lugs **12***e*, which extend horizontally at each end of the supporting plate **12**.

The angular retaining plate **41** serves to retain the fire brick **13** in position and to protect the upper faces of the same. The plate **41** is held in position by any suitable means, as by flanges at its opposite ends, and capped screws or equivalent tapped into the lateral walls **14***a* of the combustion chamber **14**.

The angle plates **42** carried by the respective doors **17**, serve to close the clearance between the doors and the fire brick retaining plate **41**. Accordingly upon closure of the door **17**, specifically shown as a pair of oppositely hinged doors, the two sections of angle plates **42** serve to preclude the flow of air forwardly of the support for the burning fuel, thus causing the air supply for the burning fuel to pass under and through the grate bars. Each plate **42** may be secured to the inner face of its door by capped screws **42***a*, see Fig. 1, or other suitable means.

The vertically extending portion **12***b* of the supporting plate may be welded or otherwise secured to the upper or body portion **12**, or may be integral therewith.

The front or open face of the combustion chamber is relatively large, to simulate the open hearth or fireplace effect. The doors **17** may be removed by removing the hinge pintles **17***b*. The doors are provided with the usual expansion vent openings **17***c*.

A pan **43** is shown in the ash pit **44** for the reception of ashes.

The invention is also adapted for use as a warm air heater for a plurality of rooms or chambers.

In Figs. 6 and 7 is illustrated one preferred form of the invention as a warm air heater; the illustrated embodiment comprises parts which correspond to the foregoing embodiments, like parts being designated by like reference characters. The embodiment includes a heated air collecting chamber **45** which is provided with one or more discharge openings **46**, through which the merged heated air passes. As illustrated, the openings **46** may discharge into a plenum chamber **47** or equivalent having an upper end closing chamber **48**, from which radiate the desired number of pipes, such as **49**, **50**, **51**, for conveying the heated air to the desired locations of discharge. The vertical and horizontal travel of the heated air is indicated by the arrows **52** and the arrows **53**.

As shown in the illustrated form of the invention, a false ceiling **55** and corresponding side walls **56** may be employed. However, any approved or other desirable construction of heated air collecting means and appurtenant parts may be used. The stack is indicated at **60**.

The invention provides for efficient superheating of the preheated air, the superheating stage being effected by controlled heating relationship of the flue piping conducting the hot products of combustion.

As above set forth, the invention further provides for efficient structural arrangement for the inflow and transition flow of separate passages on opposite sides of the combustion chamber, and a collecting chamber for the merged heated air in heated relation with the upper wall portions of the combustion chamber, the collected heated air being discharged into the room or chamber in which the heater is disposed or into a plenum chamber or equivalent means from which the heated air is led to the desired locations of discharge.

In the use of a plenum chamber, or equivalent, the room in which the heater is disposed is heated by radiant energy supplied from the fuel bed and also by the heat afforded by the exposed wall of the plenum or equivalent.

The construction shown in Fig. 8 conforms largely to that shown in Fig. 3, excepting that each grate bar is provided with a trunnion **11***d* at its rear, received within a shell **11***e*, serving as a bearing. Each shell **11***e* may be formed by shaping the rear wall **14***b* of the combustion chamber, or an opening may be formed in the rear wall **14***b* and the bearing shell attached by welding.

Whereas we have described our invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

We claim:

1. A heater comprising a combustion chamber having an open front, grate means disposed in said chamber, means coacting with said grate means for the support of solid fuel, said coacting means including an imperforate portion extending from the front of said grate means upwardly toward the open front of the chamber, pivoted door means for closing the open front of the chamber, said door means being substantially flat and means carried by the door means for substantially precluding the flow of air forwardly of the vertically extending fuel supporting means and between the same and the inner face of the door means.

2. A heater comprising a combustion chamber having an open front, grate means disposed in said chamber, means coacting with said grate means for the support of solid fuel, said coacting means including an imperforate portion extending from the front of said grate means upwardly toward the open front of the chamber, a pair of oppositely hinged doors for optionally closing the front of the chamber, and bars carried respectively by and on the inner faces of the doors and cooperating with the vertically extending fuel supporting means for substantially precluding the passage of air between the doors when in closed position and the vertically extending fuel supporting means.

3. A heater comprising a combustion chamber having an open front, grate means disposed in said chamber, means coacting with said grate means provided with fire brick for the support of solid fuel, said coacting means including an imperforate portion extending from the front of the grate means upwardly toward the open front of the chamber, pivoted door means for optionally closing the open front of the chamber, and means carried by the door means on its inner face for cooperation with the upwardly extending fuel supporting means for substantially precluding the passage of air between the door means and the vertically extending fuel supporting means, said door means being provided with adjustable air flow means disposed below said air passage precluding means for affording air flow to and through said grate means.

4. The combination of a combustion chamber having side and rear walls gradually decreasing in cross sectional area in upward direction, wall means disposed exteriorly of said combustion chamber having a front wall provided with an opening and in spaced relation to the rear wall of said combustion chamber and defining therewith a channel, the upper part of which increases in cross sectional area in upward direction, for the flow of air in heat exchange contact with the rear wall of said combustion chamber, a header in the upper part of said channel communicating with said combustion chamber, duct means comprising wall means disposed at one side and exteriorly of said combustion chamber and extending substantially from a location coincident with the front of said combustion chamber to a location substantially coincident with the rear wall of said combustion chamber and communicating at its rear with said heated air channel, duct means comprising wall means disposed at one side and exteriorly of said combustion chamber and extending substantially from a location coincident with the front of said combustion chamber for the supply of air upwardly adjacent one side wall of the combustion chamber, said second-named duct means being disposed above said first-named duct means at the same side of said combustion chamber, fuel supporting means disposed within said combustion chamber and accessible through the opening of the front wall of said combustion chamber, and a casing inclusive of said rear wall means and of the wall means of said first-named duct means and of the wall means of said second-named duct means, respectively, surrounding said side walls and said rear wall of the combustion chamber serving to complete the resulting heated air channels.

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