

June 4, 1946.

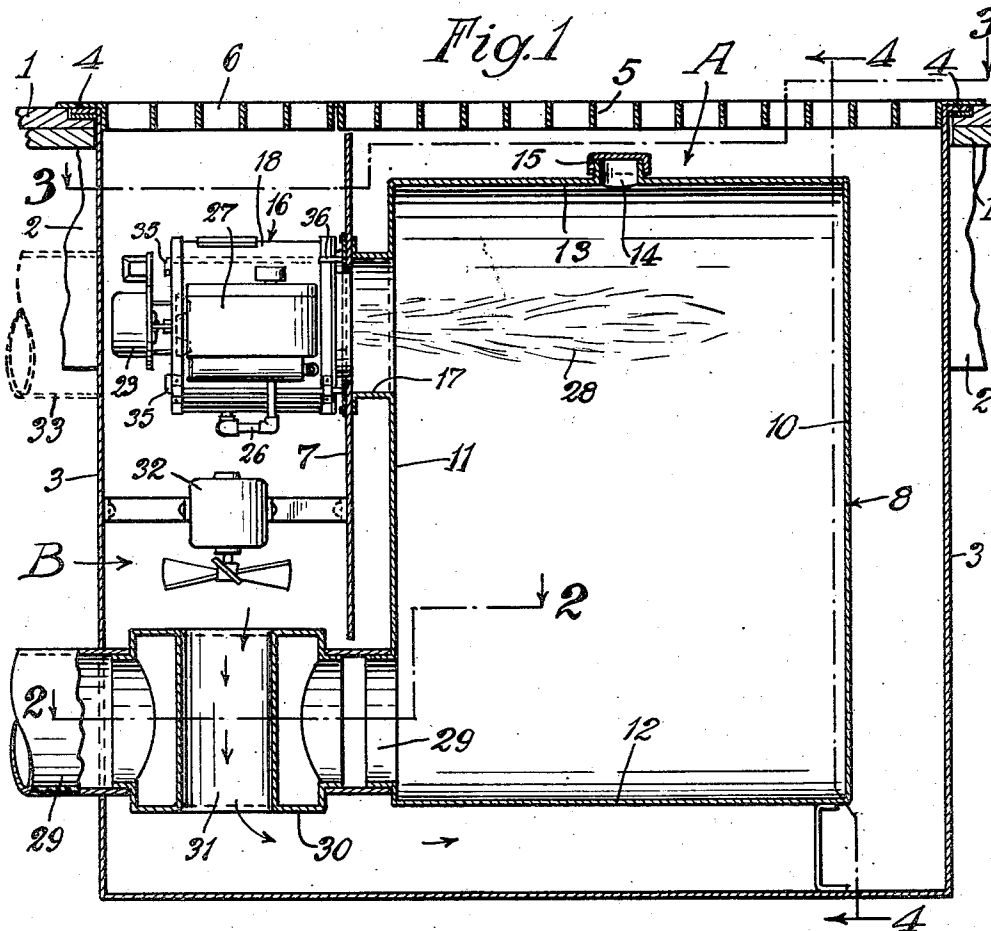
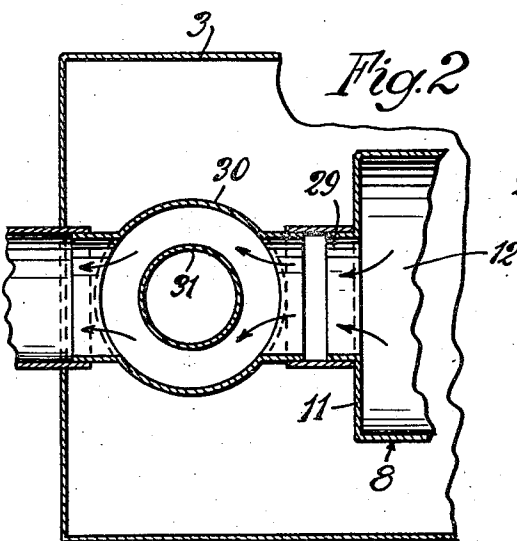
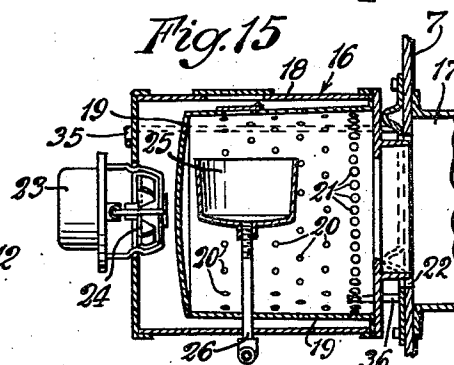
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2,401,330

FLOOR FURNACE WITH HORIZONTAL BURNER

Filed June 3, 1942

6 Sheets-Sheet 1



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FLOOR FURNACE WITH HORIZONTAL BURNER

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Fig. 3

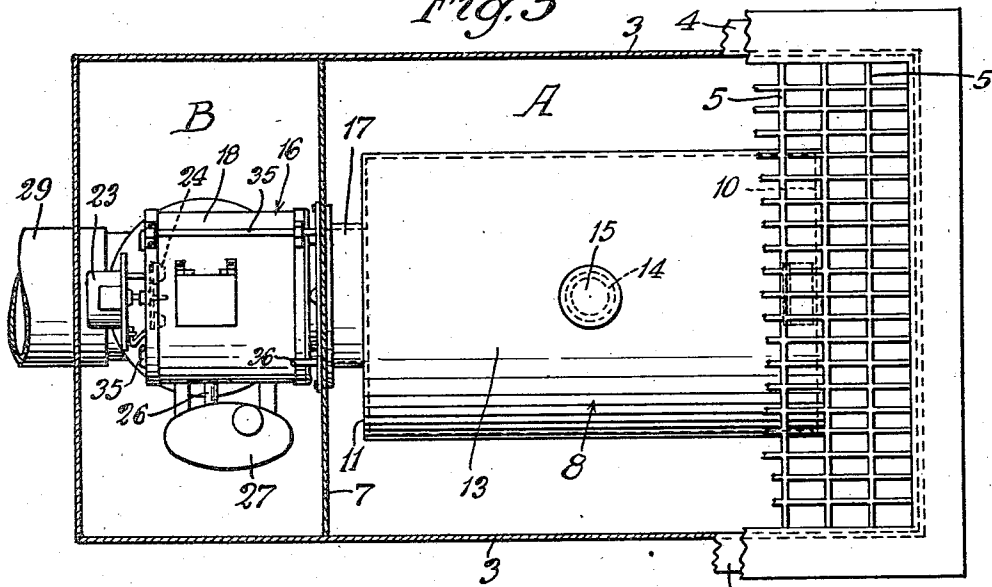
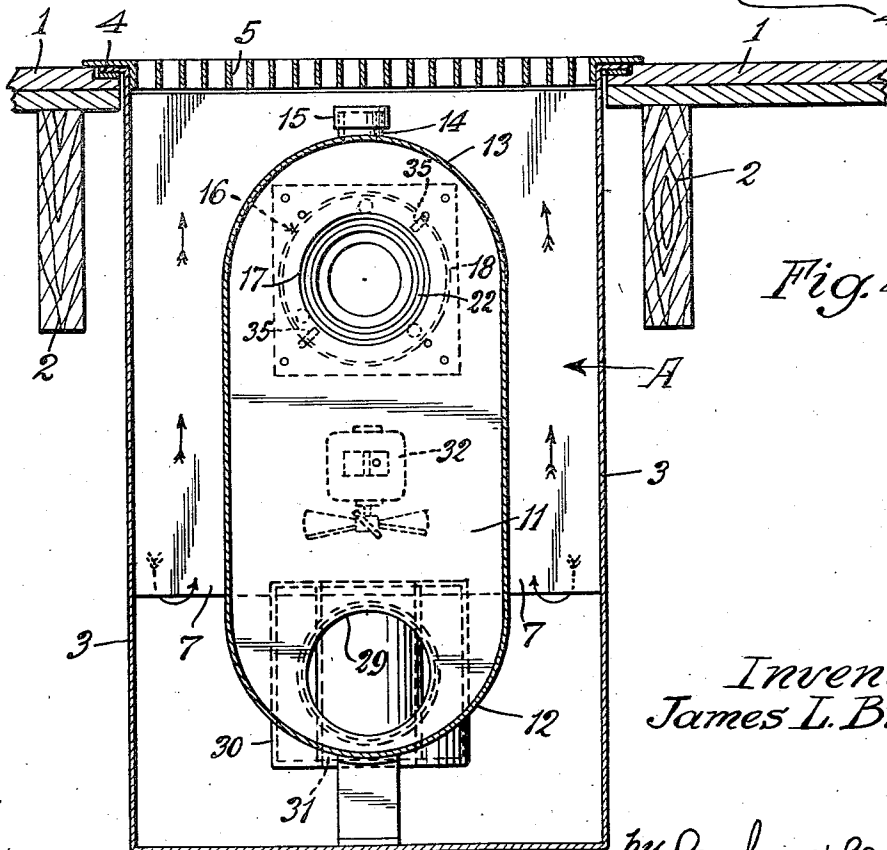


Fig. 4



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6 Sheets-Sheet 3

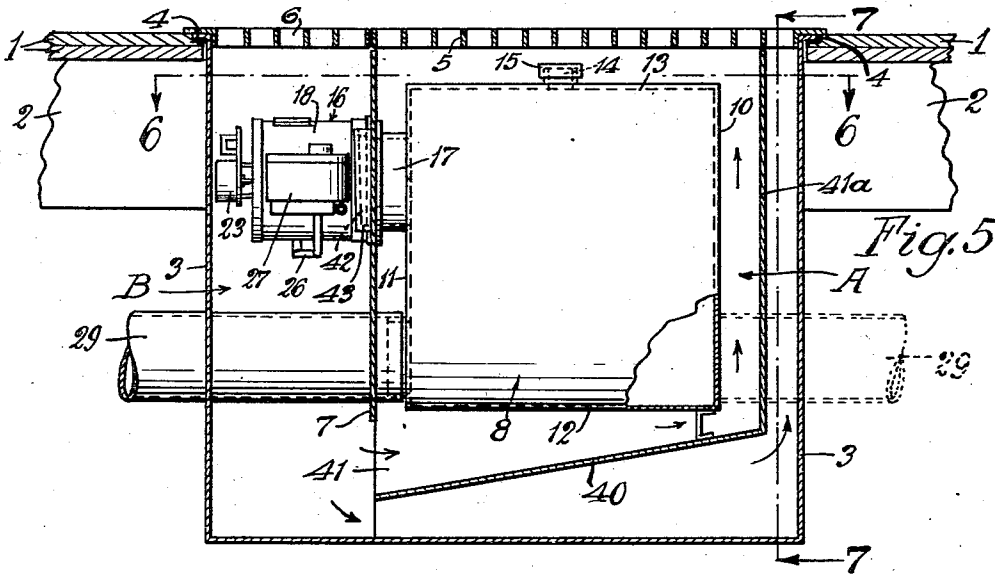
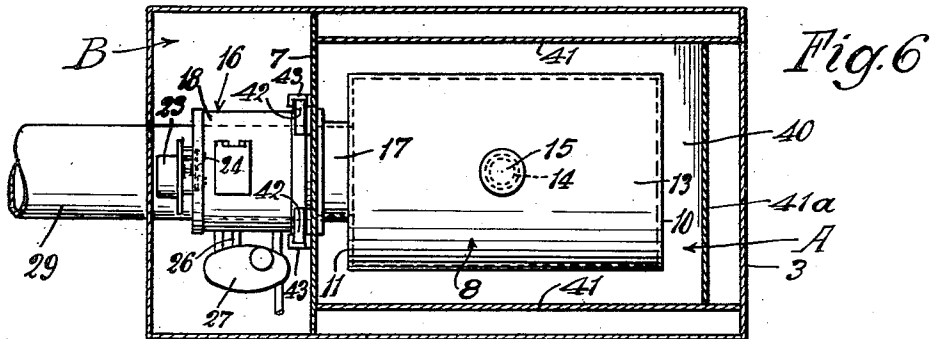
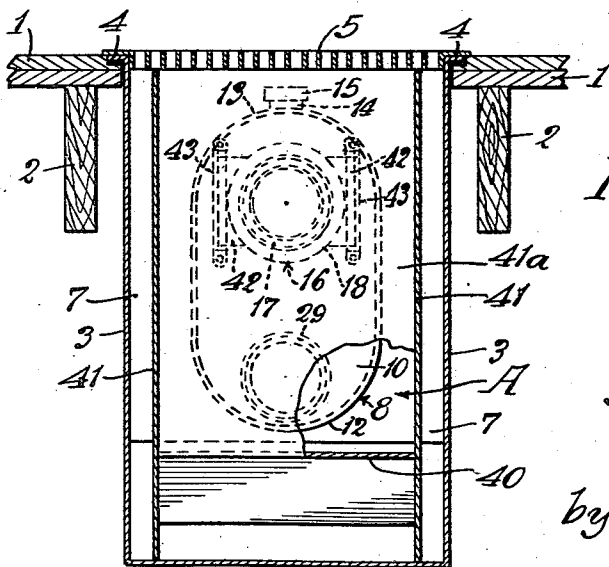


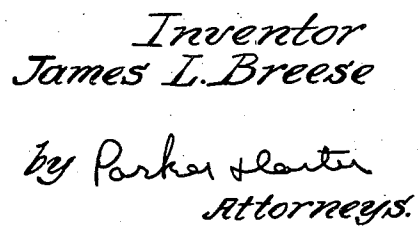
Fig. 7

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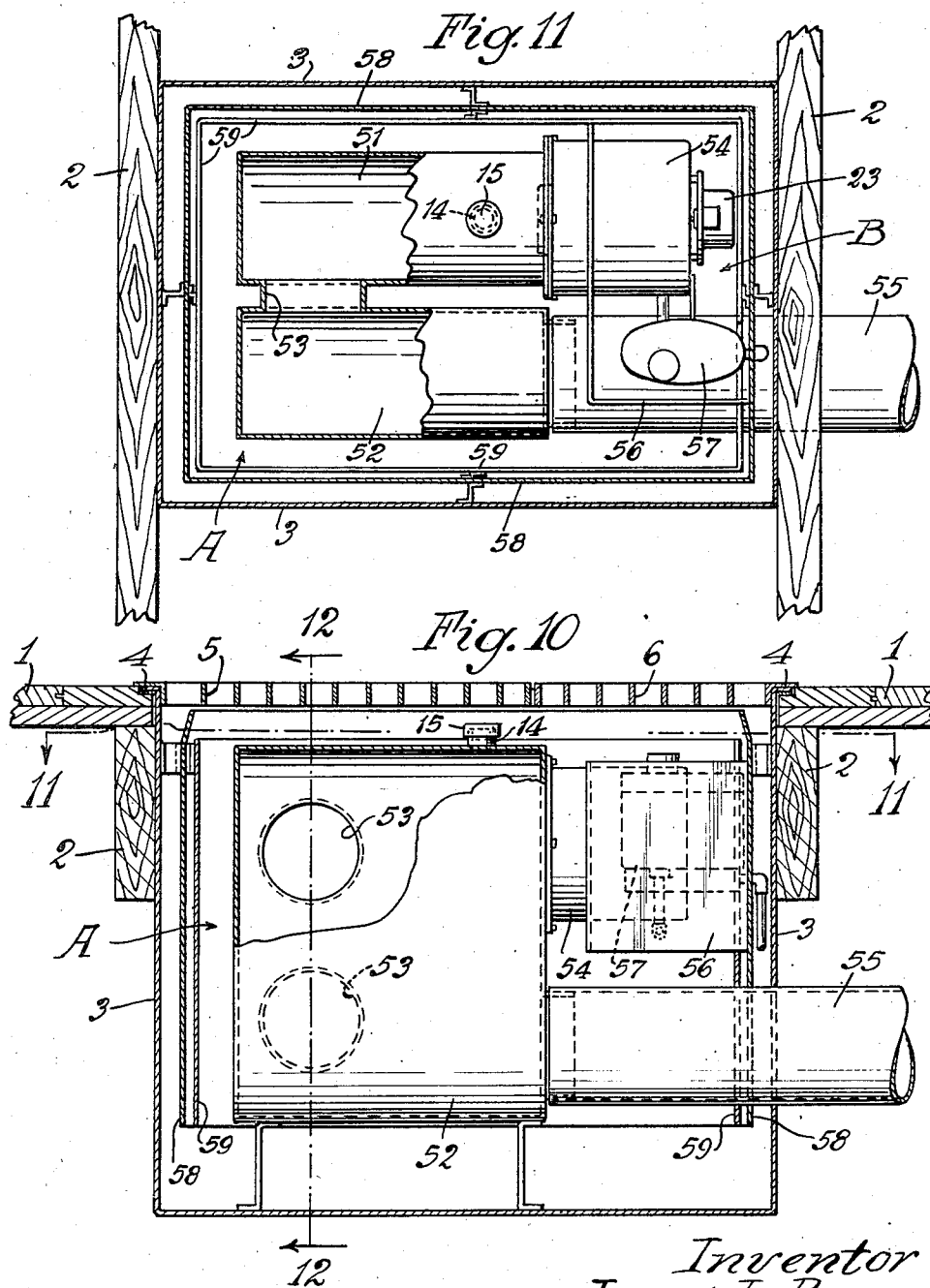
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June 4, 1946.

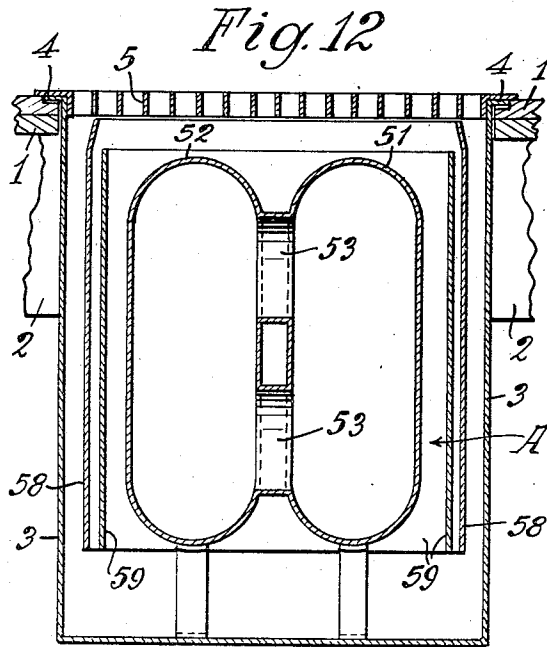
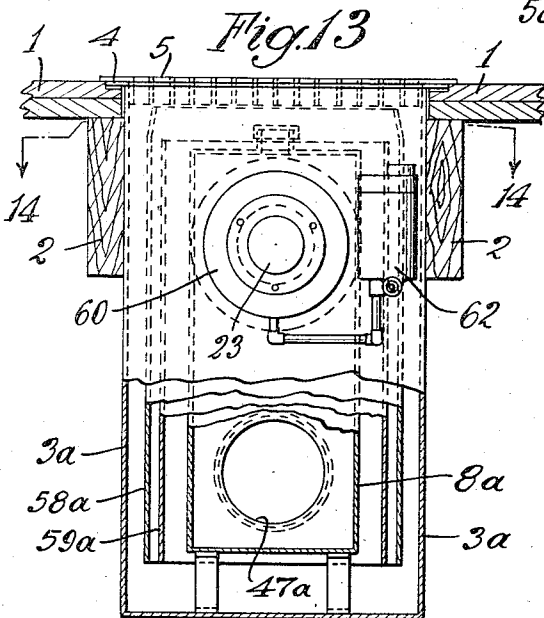
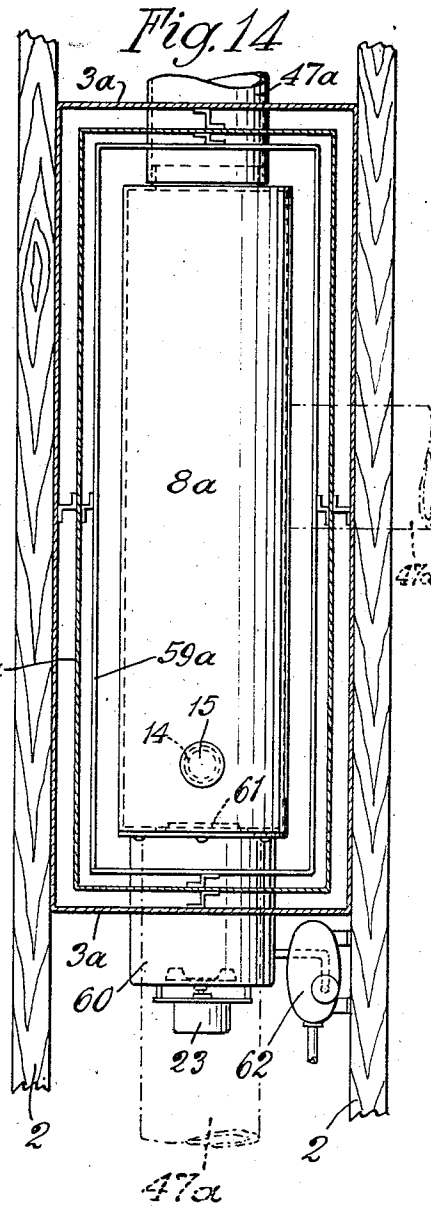
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2,401,330

FLOOR FURNACE WITH HORIZONTAL BURNER

Filed June 3, 1942

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,401,330

FLOOR FURNACE WITH HORIZONTAL
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Application June 3, 1942, Serial No. 445,563

9 Claims. (Cl. 126—116)

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The invention relates to an improvement in floor furnaces and has for one purpose the provision of an improved floor furnace of increased efficiency.

Another purpose is the provision of means for increasing the readiness of flow of the cold air to the heating zone, in which it is subjected to the heat of the furnace.

Another purpose is the provision of an improved location of the burner or of a burner and control unit in relation to the furnace and to the floor of the room to be heated.

Another purpose is the provision of improved access means for permitting access to and servicing of burner and burner controls.

Another purpose is the provision of improved baffling means for controlling the flow of the cold air to be heated in relation to the heat exchange member.

Another purpose is the provision of improved cold air inlet means in which the cold air is subjected to a minimum area of heated surface as it flows downwardly, and in which there is a minimum tendency of the heating of cold air to interfere with its ready down flow.

Another purpose is the provision of an improved burner and furnace unit.

Other purposes will appear from time to time in the course of the specification.

The invention is illustrated more or less diagrammatically in the accompanying drawings wherein:

Fig. 1 is a vertical section;

Fig. 2 is a section on the line 2—2 of Fig. 1;

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

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a vertical section through a variant form of the device;

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

Fig. 7 is a section on the line 7—7 of Fig. 5;

Fig. 8 is a vertical section through a further variant form of the device;

Fig. 9 is a section on the line 9—9 of Fig. 8;

Fig. 10 is a vertical section through a further variant form of the device;

Fig. 11 is a section on the line 11—11 of Fig. 10;

Fig. 12 is a section on the line 12—12 of Fig. 10;

Fig. 13 is a vertical section through a further variant form of the device;

Fig. 14 is a section on the line 14—14 of Fig. 13; and

Fig. 15 illustrates a horizontal pot type burner which may be employed with floor furnaces made in accordance with the present invention.

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Like parts are indicated by like symbols throughout the specification and drawings.

Referring first to the form of Fig. 1, 1 generally indicates the floor in which the furnace is mounted. 2, 2 indicate joists. 3 is an outer housing herein shown as of sheet metal. It may be mounted in the floor, for example, by the employment of the upper flange 4. 5 is any suitable and preferably removable grille over the furnace proper, and 6 is an additional and preferably separably removable grille over the cold air duct. 7 is a baffle extending transversely across the housing 3.

As will appear in Fig. 3, the space A at one side of the baffle 7 is the space within which the combustion chamber or heat exchange member 8 is mounted, and the space B constitutes a down draft or cold air flue or passage. It will be observed that all or substantially all of the air to be heated flows down the space B and passes about the lower edge of the baffle 7 before flowing upwardly on its return passage about the heat exchange member or combustion chamber 8. For example, in the structure shown in Figs. 1 to 7, all the cold air passes downwardly through the flue space B and from this single source is delivered for heating by the burner and heat exchange member, and also for protecting the outer housing from the heat of combustion.

Any suitable baffling may be employed for protecting the outer housing 3 and thus the adjacent part of the floor or joists from overheating. It will be understood, however, that in the operation of the device the cold air supply for the heater is delivered down the passage B. Any suitable heat exchange member or combustion chamber or drum may be employed, but the member 8 is illustrated herein as having opposite vertical end walls 10, 11, and rounded bottom and top walls 12, 13.

14 is any suitable observation aperture or member which may be closed by a removable cover 15. The cover 15, if desired, may be made of some transparent material so that the operator can inspect the interior of the drum 8 during the operation of the device.

It is in practice advantageous to position the burner adjacent the top of the drum 8. Illustrated herein is a burner assembly generally indicated as 16, which is located in the down draft or cold air passage B and is aligned with a neck 17 communicating with an upper portion of the drum 8. While a variety of heating members may be employed, there is illustrated a horizontally positioned pot type burner, shown in some

detail in Fig. 15. 18 illustrates an outer drum or cylinder, within which is a pot 19, having a plurality of primary air inlet apertures 20 and having adjacent its discharge end a plurality of secondary air inlet apertures 21, herein shown as located in a single row about the pot.

Tertiary air or additional secondary air may also enter through the gap 22. 23 is a motor actuating a fan 24, adapted to draw air from the space B and deliver it under some pressure to the space between the outer cylinder and the pot. 25 is any suitable vaporizing cup connected by a feed passage 26 with any suitable float chamber or control means 27, which may for convenience be mounted on the motor unit and be located also within the cool air duct B.

Liquid fuel from any suitable source may be delivered to the float chamber 27 and is thereby metered and delivered to the vaporizing cup.

Referring to Fig. 1, the flame is delivered toward the right and extends horizontally, as shown at 28, a substantial distance into the upper portion of the drum 8, when at high fire. Heated gases and products of combustion flow generally downwardly and outwardly through any suitable discharge flue. There is illustrated for example a discharge flue 29 extending outwardly from a lower portion of the drum 8. In the form of Fig. 1 the flue passage 29 extends beneath the baffle 7 and through the down draft passage B. If desired, any suitable economizer structure, as shown at 30, may be employed, herein illustrated, for example, as an enlargement of the flue 29, provided with a central passage 31.

An air circulating fan may be employed, as shown in Fig. 1, which illustrates a motor and fan unit 32 mounted in the down draft passage B and aligned generally with the central passage 31 of the economizer.

All of the air, both for the burner and for room heating, may be supplied by the down draft B. However, if desired, an additional cold air intake or return may be employed, as illustrated at 33, in dotted lines, in Fig. 1, such cold air return being aligned with the burner unit and adapted not only to supply air for the burner but to assist in cooling the burner. However, under most circumstances the down draft passage B is sufficient.

It will be observed that the motor unit and the air circulating fan are both conveniently located for access through the top of the down draft passage B, the removable grille 6 giving easy access thereto. Preferably the burner unit with its booster fan and its oil control 27 may be removed as a unit, but may be secured in position for example by the long holding screws 35 and studs 36.

Referring to the form of Figs. 5 to 7, the structure is substantially as shown in Figs. 1 to 4, with the addition of protecting baffling, including a bottom baffle 40 associated with side baffles 41, which extend to the bottom, and an end baffle 41a, which does not. The air to be directly heated by the heat exchange member 8 all passes above the baffle 40 and passes directly upwardly about the bottom and side of the member 8. In this form of the device no direct radiation from the burner is received by the outer housing. The protecting air passes below the baffle 40. Part of this air passes into the space between the outer housing 3 and the side baffles 41, and thence upwardly. Part of it passes through the space between the end of the outer housing and the cross baffle 41a. The result is a complete protection of the outer housing.

A variant form of mounting means for the burner 16 is illustrated in Figs. 5 to 7. The outer drum 18 is provided with wedge formed flanges 42 at either side, which are received in correspondingly formed guide channels 43 mounted on the baffle 7, in alignment with the neck 17 of the drum 8. The parts are formed and proportioned to position the burner in proper alignment with the neck 17.

Referring to the form of Figs. 8 and 9, the horizontal burner unit, generally indicated as 45, extends through the down draft defining baffle 46. Part of the burner 45 is located in the down draft passage B and part in the drum 8. In this form the flue 47 is shown as extending from a lower portion of the drum 8 but from the opposite side. The control or float valve unit 48 is in this form shown as mounted within the down draft passage B, and as provided with additional protective baffling, as at 49. A protecting baffle 50 also surrounds the entire unit, and, if desired, it may support an additional inner baffle 50a, to prevent overheating of the outer housing 3.

Referring to the form of Figs. 10 and 11, there are illustrated two separate drums 51 and 52 connected by one or more ducts 53, located as desired. The burner unit 54 is aligned with and delivers a flame into the upper portion of the heat exchange member 51. The heated gases pass laterally through the ducts 53, through the second heat exchange member 52, and outwardly through the flue passage 55. In the form of Fig. 11 the baffle 56 is employed to define the down draft duct B, and within this down air duct are located part of the burner unit 54 and all of the control unit 57. In this form there is illustrated a double baffle structure 58, 59 to prevent overheating of the outer housing 3 and of adjacent joists and floor parts.

Referring to the form of Figs. 13 and 14, the outer housing 3a is changed in form, being made longer and narrower in order to pass between a pair of joists 2 and prevent any necessity of cutting joists. The burner unit 60 is shown as extending inwardly through one end of the outer housing 3a and through the protecting baffles 58a and 59a. The drum or combustion chamber or heat exchange member 8a is correspondingly elongated, and the burner unit 60 communicates therewith through the inlet aperture 61. The control or valve unit 62 is shown as located exteriorly of the outer shell 3a. It will be understood, of course, that a separate movable access panel may be employed for ready access thereto, or that the outer shell 3a may be elongated to receive it. The flue 47a may extend from either end of the drum.

It will be realized that, whereas a practical and operative device in several forms has been described and illustrated, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of the invention. It is therefore wished that the description and drawings be taken as in a broad sense illustrative or diagrammatic, rather than as a limitation to the precise showing.

The use and operation of the invention are as follows:

In floor furnace construction, in addition to designing for heating efficiency, it is desirable to have the burner unit and its controls readily accessible for insertion, servicing, removal and inspection. In all the forms herein shown the motor unit and the associated controls are ac-

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cessible through the floor of the room or space to be heated. In most forms herein shown both the burner unit and its control or float chamber valve structure are located in the cold air down draft passage. Referring for example to the form of Figs. 1 and following, Figs. 8 and 9, and Figs. 10 and 11, all or substantially all of the air to be heated flows down a single cold air duct of very substantial cross sectional area. The air of the room or space to be heated is, of course, coldest along the floor. This cold air flows into the down passage B and serves to cool and protect the burner and the float chamber or control for the burner.

In its downward flow the cold air in the passage B is subjected to only a relatively small heated area of the baffle 7, or, in the form of Figs. 8 and 9, of the baffle 46. The air thus remains relatively cold, and flows readily to the bottom of the baffle 7, and does not become heated to any substantial degree until after it has passed the bottom of the baffle 7 and has begun to move upwardly about the bottom of the drum or heat exchange member 8. If the cold air is heated as it flows down through the conventional narrow passages of the prior art, it tends to rise and oppose the down flow.

The booster fan and the float chamber and the circulating fan 32 are all prevented from overheating even though they are located but a few inches from the heat exchange member 8. The down flow of cold air is adequate protection. Under most circumstances the fan 32 may be dispensed with, but may be useful for controlling or increasing the down flow of cold air.

The single cold air return B, relatively unrestricted and of liberal size, provides an abundance of cold air to the space below and about the bottom of the drum 8, from which location, as the air is heated, it rises freely about the drum and through the grille 5. The use of the large air passage with a definite division between hot and cold air sections decreases the resistance to downward flow caused by the premature heating of the air, and increases the volume of heated air delivered. This arrangement is more healthful and it is more satisfactory to heat with a large volume of relatively low temperature air than with a smaller volume of air raised to a higher temperature.

It is advantageous to deliver the heat to the drum 8 adjacent the top of the drum. The location of the flame 28 causes the top of the drum to be the hottest part of the drum, although the entire drum is relatively highly heated. The cold air flows upwardly about the outside of the drum 8, and the heated gases flow downwardly within the drum 8, an advantageous condition for efficient heating of the cold air for delivery to the room through the grille 5. This reverse or counter flow promotes maximum cooling effect.

What is claimed is:

1. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat ex-

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change member positioned in the updraft passage, flue means extending from the heat exchange member in the updraft passage at a level substantially below said grill, a liquid fuel burner positioned in the downdraft passage, means for supplying combustion air to the fuel burner from said downdraft passage, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, and means for delivering a liquid fuel to said burner.

2. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, flue means extending from the heat exchange member in the updraft passage at a level substantially below said grill, a horizontal pot type liquid fuel burner positioned in the downdraft passage, means for supplying combustion air to the fuel burner from said downdraft passage, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, and means for delivering a liquid fuel to said burner.

3. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, flue means extending from the heat exchange member in the updraft passage at a level substantially below said grill, a horizontal pot type liquid fuel burner positioned in the downdraft passage and adapted to receive its air supply therefrom, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, and means for delivering a liquid fuel to said burner, said burner including a horizontally axised pot the interior of which is in communication with the interior of the heat exchange member, said pot having a circumferential wall with air inlets circumferentially spaced thereabout and located at various distances from the ends of the pot, and an outer housing surrounding said pot,

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said outer housing being apertured in communication with the downdraft passage to permit the entry of air from said downdraft passage to the space about said pot.

4. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, flue means extending from the heat exchange member in the updraft passage at a level substantially below said grill, a horizontal pot type liquid fuel burner positioned in the downdraft passage and adapted to receive its air supply therefrom, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, and means for delivering a liquid fuel to said burner, said burner including a horizontally axised pot the interior of which is in communication with the interior of the heat exchange member, said pot having a circumferential wall with air inlets circumferentially spaced thereabout and located at various distances from the ends of the pot, and an outer housing surrounding said pot, said outer housing being apertured in communication with the downdraft passage to permit the entry of air from said downdraft passage to the space about said pot, and a booster fan aligned with said housing aperture and means for rotating it.

5. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, a liquid fuel burner positioned in the downdraft passage, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, means for supplying combustion air to the fuel burner from said downdraft passage, means for delivering a liquid fuel to said burner, and flue means extending from said heat exchange member at a level below said burner, said flue means extending through said downdraft passage.

6. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate

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the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, a liquid fuel burner positioned in the downdraft passage, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, means for supplying combustion air to the fuel burner from said downdraft passage, means for delivering a liquid fuel to said burner, and flue means extending from said heat exchange member at a level below said burner, said flue means extending through said downdraft passage, and including an economizer in the line of flow of the air through said downdraft passage.

7. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, flue means extending from the heat exchange member in the updraft passage at a level substantially below said grill, a liquid fuel burner positioned in the downdraft passage, means for supplying combustion air to the fuel burner from said downdraft passage, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, and means for delivering a liquid fuel to said burner, and a fan in said downdraft passage, adapted to accelerate the movement of air downwardly through said passage, and means for actuating said fan.

8. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, flue means extending from the heat exchange member in the updraft passage at a level substantially below said grill, a liquid fuel burner positioned in the downdraft passage, means for supplying combustion air to the fuel burner from

said downdraft passage, said partition means being apertured between said burner and said heat exchange member, the burner being in communication through said aperture with the interior of the heat exchange member, said burner being in the path of and substantially surrounded by air moving through said downdraft passage, and means for delivering a liquid fuel to said burner, and a cold air duct extending to said downdraft passage, adapted to supplement the supply of air flowing downwardly through said passage.

9. In a floor furnace, a furnace housing the top of which is open to the room to be heated, partition means extending substantially completely across the housing from side to side intermediate the ends thereof and defining within the housing a downdraft passage and an updraft passage, said partition means terminating in spaced relation to the bottom of the housing whereby said passages are in communication adjacent the bottom of the housing, removable grill means positioned adjacent the plane of the top of the housing and

adapted to be generally flush with the floor level of the room to be heated, a heat exchange member positioned in the updraft passage, a liquid fuel burner and control unit removably positioned in said downdraft passage, said partition means being apertured between said burner and said heat exchange member, the burner being in communication, through said aperture with the interior of the heat exchange member, said burner unit including a horizontally axised burner pot having an open end, a circumferential side wall and a closed end, said side wall having a plurality of air inlet apertures located at various distances from the end of the pot, and an outer housing having an aperture positioned to admit air from the downdraft passage to the space about the pot, said burner and control unit further including a float valve assembly mounted thereon, said entire burner and control unit, including said float valve assembly, being readily and bodily removable upwardly through said downdraft passage.

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