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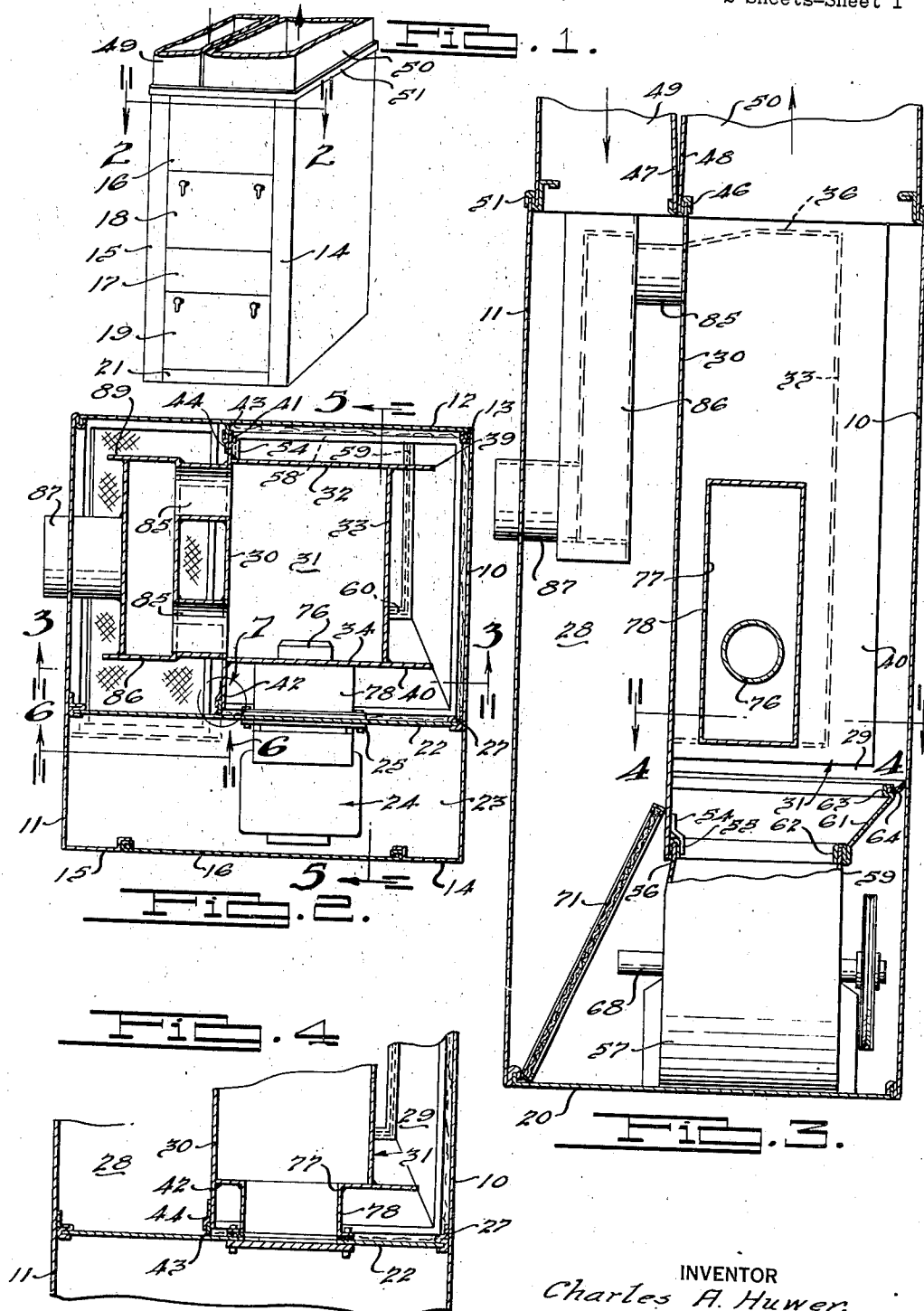
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2,380,110

FURNACE

Filed March 14, 1942

2 Sheets-Sheet 1



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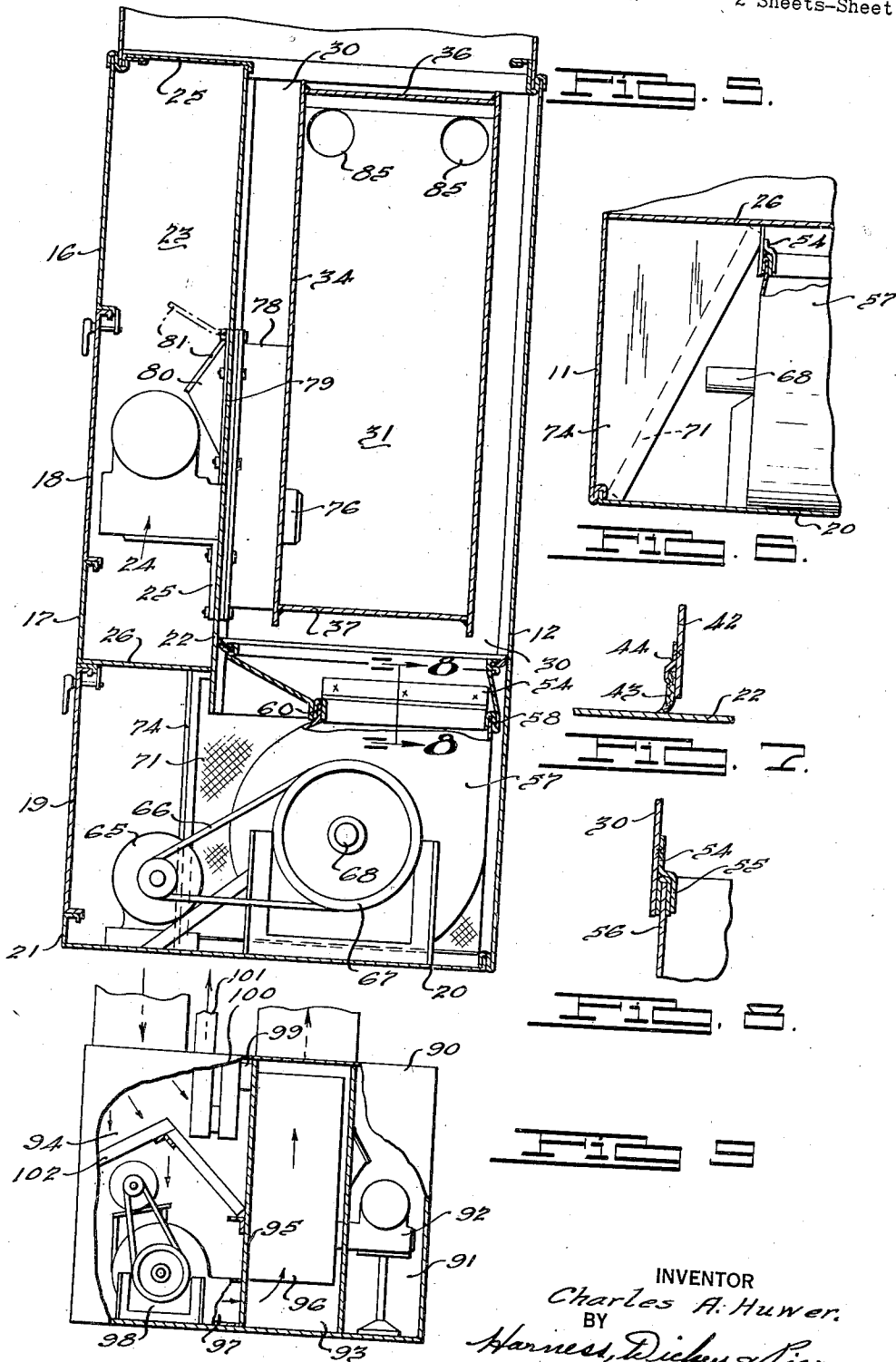
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FURNACE

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13 Claims. (Cl. 126—110)

The invention relates generally to furnaces and it has particular relation to a forced air circulating furnace adapted for use in homes or similar buildings.

The use of forced air heating systems for heating homes has greatly increased in the last few years and at the present time practically all new installations are of this character. Along with this increased use of forced air heating systems, greater attention has been directed to the use of basements and utility rooms, especially in smaller homes, and at the present time the prospective purchaser of a home is influenced considerably by the arrangement in the basement and the amount of free room or space which renders the basement or utility room usable in different ways. By having forced air circulating systems as compared to gravity heating systems, the air ducts can be disposed horizontally against the ceiling and thus there is no interference on account of inclined pipes. Moreover, the use of forced air circulation has allowed the use of smaller air ducts and this is an additional factor reducing the amount of space required for the furnace installation. Considering these facts, it is natural that the builder should desire a furnace as small as possible in order to conserve space while still having a unit which is sufficient to properly heat the home. Moreover, a smaller heating unit enables the builder to place the unit in positions where it might not be possible in the case of a larger furnace, and this naturally results in greater furnace adaptability in different designs of buildings. Such factors also affect the prospective purchaser and home owner for similar reasons.

One object of the present invention is to provide an improved furnace of the general character indicated, which is so constructed and arranged that a smaller space is required for the furnace without sacrificing heat capacity.

Another object of the invention is to provide a furnace such as mentioned which is even more efficient in the matter of extracting heat from the heating element and exhaust gases, all to the end that the cost of operating the furnace will be decreased.

Another object of the invention is to provide a furnace such as mentioned which costs less to manufacture and assemble so as to thereby reduce the initial cost of the furnace and consequently the cost of the home or building in which it is placed.

Other objects of the invention will become apparent from the following specification, from the

drawings relating thereto, and from the claims hereinafter set forth.

For a better understanding of the invention, reference may be had to the drawings wherein:

Figure 1 is a fragmentary elevational view showing a furnace constructed according to one form of the invention;

Fig. 2 is a cross-sectional view on a larger scale taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is a cross-sectional view taken substantially along the line 5—5 of Fig. 2;

Fig. 6 is a cross-sectional view taken substantially along the line 6—6 of Fig. 2;

Fig. 7 is a view on a larger scale of the detail shown in the circle 7 of Fig. 2;

Fig. 8 is a cross-sectional view taken substantially along the line 8—8 of Fig. 5; and

Fig. 9 is a side elevational view, with parts broken away and shown in cross-section, illustrating another form of the invention.

Referring to Figs. 1 to 5, inclusive, the furnace casing comprises oppositely disposed side walls 10 and 11 which are joined to a back wall 12 by interfolded and welded metal edges indicated generally at 13. At their front edges the walls 10 and 11 have flanges 14 and 15 and between these flanges, fixed panels 16 and 17, as best shown by Fig. 1, are provided so as to connect the flanges across the front of the casing. The edges of such panels and flanges may have suitable contacting edge portions welded or otherwise joined so as to provide a positive connection. Upper and lower doors 18 and 19 are provided between the panels so that access may be had to the burner and to the blower as will be presently seen. As seen in Fig. 5, a bottom wall 20 is provided and this is fastened to the side and back walls by interfolded edges such as mentioned and at its front, the wall 20 has an upwardly turned flange 21 disposed between the side flanges 14 and 15 and terminating at the bottom edge of the door 19.

As best shown by Figs. 2 and 5, the casing has an intermediate wall 22 which is fastened at its edges to the side walls 10 and 11 and this intermediate wall is located rather adjacent the doors 18 and 19 and provides a space 23 for an oil burner or other heating unit 24, which is supported on a bracket 25 fastened to such wall. At upper and lower ends of the space, such space is closed by means of upper and lower walls 25 and 26, from which it follows that the burner is lo-

cated in a space which is separated from the remainder of the casing. It might be added that the side edges of the intermediate wall 22 may be firmly connected to the side walls 10 and 11, such as by attaching strips 27, and these may be welded, for example, to the side wall. Similarly, the walls 25 and 26 at the upper and lower ends of the space 23 may be welded to the panels 16 and 17, respectively, and to the intermediate wall 22.

For dividing the space between the back wall 12 and intermediate wall 22 into cold air and warmed air chambers, indicated at 28 and 29, respectively, a partitioning wall 30 is provided and this wall forms an integral part of a box-like heating chamber or element indicated generally by the numeral 31. This heating element, in addition to the wall, 30, has vertically extending side walls 32, 33, and 34 which are welded together and the upper and lower ends of the heating element are closed by top and bottom walls 36 and 37, which are welded to the side walls. It will be understood that all of these walls forming the heating element are seam welded or otherwise sealingly welded so that gases within the heating element do not escape into the space around the latter. It may be noted also that the walls 32 and 34 project substantially beyond the side wall 33 and top and bottom walls 36 and 37 to provide fins 39 and 40, and these provide additional, heated surfaces over which circulating air will flow. At opposite sides, the wall 30 projects laterally towards the back wall 12 and the intermediate wall 22 as indicated at 41 and 42, and, as also shown by Fig. 7, on the extreme edges of these projecting portions, flexible sealing strips 43 are fastened by means of sheet metal holding strips 44 fastened to the flanges. These sealing strips contact the wall 12 and wall 22 so that normally air will not flow past such edges from one chamber to the other. It may be stated too that if a positive connection is required, the portions 41 and 42, instead of having sealing strips 43, may have their outer edges bent parallel to and bolted to the walls 12 and 22, respectively. Sealing gaskets could also be inserted between such flanges and walls.

As shown best by Fig. 3, the wall 30 at its upper end projects above the end wall 36 and engages in one fold of an S-shaped strip 46 and the opposite fold of the strip 46 receives wall portions 47 and 48 of cold and warmed air ducts 49 and 50, respectively. The remaining walls of the ducts are similarly connected to the upper edges of the outer walls of the casing by means of fastening strips 51 and these may be welded to the connected parts if desired.

At its lower end, the wall 30 projects substantially below the bottom wall 37, and, as best shown by Figures 5 and 8, a strip 54 is welded to the lower edge of the wall and this strip has an offset portion 55 which provides a slot at the end of the wall. This slot receives the upper edge portion of one wall 56 of the outlet end of a blower housing 57 having additional walls 58, 59, and 60, as seen in Fig. 2, which jointly form a substantially square discharge opening for the blower. The blower housing is supported on the bottom wall 20 of the furnace in turn to be supported on the basement floor or furnace base and this serves to support the wall 30 and the heating element forming a part thereof.

Referring to Figs. 2, 3, 4 and 5, the lower end of the space 29 is sealed around the blower dis-

charge opening by means of an inclined sheet metal member 61 extending upwardly from the three walls 58, 59, and 60 of the blower and which has a folded lower edge 62 receiving the upper edges of such walls. At its upper edge, the member 61 has a channel 63 in which a flexible sealing strip 64 is clinched and such strip, in turn, has sealing contact with the walls 10, 12 and 22 of the furnace. As best seen in Figs. 3 and 8, the lower folded part 62 of member 61 also extends along and receives the upper edge of the wall 56 of the blower and it will be noted that the offset portion 55 on wall 30 is sufficiently spaced from the latter as to receive such folded part.

From the foregoing it will be evident that the member 61 may be easily placed on the upper edge of the blower opening and that it, in conjunction with the offset 55 on wall 30, seals the lower part of space 29 around the blower discharge opening. Moreover, it will be appreciated that the member 61 is sturdy in character and that its inclined walls will avoid corners or pockets so as to thereby increase the efficiency of air flow. Finally, it may be noted that when assembling, the blower may be placed in position, then the member may be placed in position and that then the wall 30 may be lowered so as to engage the wall 56 of the blower. Manufacture and assembly is thus greatly simplified while still obtaining sealed contacts where necessary.

As shown by Fig. 5, the blower is driven by means of a motor 65 having a belt 66, which engages a pulley 67 mounted on the blower shaft indicated at 68. The blower is of standard design and it will be understood that with the blower operating air is drawn into the center of the blower which is open at opposite ends of the shaft 68.

Now referring to Fig. 3 again, a filter 71 is disposed at the bottom of the cold air inlet chamber 28 and this filter is so disposed that it rests on the bottom wall 20 and leans against the lower portion of the partitioning wall 30. As shown best by Fig. 5, the right hand end of the filter 71 fits up against the back wall 12, but the front end or left hand end of the filter is substantially spaced from the door 19. In order to prevent air drawn by the blower from passing around this end of the filter instead of through it, a triangular piece of metal 74 is provided, as shown by Figures 5 and 6, and this may be fastened to the wall 26 and to the side wall 11. From this it should now be apparent that air drawn through the chamber 28 will first pass through the filter 71, then through the central part of the blower, then upwardly through the discharge end of the blower, and then upwardly around the heating element and along its surfaces, and finally the air will discharge into the warmed air duct 50.

The burner 24 as shown is of the gun fired type and the barrel of the burner, indicated at 76, projects through the intermediate wall 22 and through the side wall 34 of the heating element so that the burning of the oil mixture will take place within the heating element. In order that the barrel 76 will project into the heating element, the wall 22 and the wall 34 have corresponding rectangular openings such as indicated at 77 in Fig. 3 and between these openings a rectangular closure 78 is provided which is welded to the wall 34 and bolted to the wall 22 in a sealing manner so that gases cannot escape into the air circulating chambers. The burner 24, as previously mentioned, is fastened to the supporting bracket 25 on the wall 22 and is so located that

the burner 76 extends through the closure 78 and into the heating element.

The rectangular opening in the wall 22 and through which the barrel 76 extends is closed externally of the wall 22 by means of the supporting bracket 25 and an upper plate 79, although any suitable means may be used for closing the outer side of the wall 22 around the barrel. In order to provide means for creating an opening through such wall 22 in the event of any rapid expansion of gases and in order to permit viewing the burner flame, an access box 80 having a lid 81 may form part of the plate 79, but it will be understood that normally the lid is closed so that air does not enter into the heating element except through the burner. It might be mentioned at this time that instead of using an oil burner a gas fired burner may be employed and variations to accommodate the gas burner may readily be made.

In order to evacuate burnt gases, flue pipes 85 are connected to the upper end of the heating element wall 30. These flues are connected in turn to an economizer unit 86 which is disposed within the cold air chamber 28 and the economizer unit, in turn, is connected to a lower flue element 87 that extends outwardly through the wall 11 of the furnace. It is to be understood that connections between these parts are such that no gases can escape into the air circulating chamber and preferably all joints are seam or otherwise welded to accomplish this result. It might be noted too that the economizer unit 86 is provided with fins 89, as shown in Fig. 2, to further increase heat conducting surfaces adapted to contact the air.

From the foregoing description, it will now be apparent that with the burner operating all walls and fins of the heating element are heated and air forced upwardly by the blower will pass over all of the heated surfaces located within the chamber 29, which will substantially warm this air before it passes outwardly through the duct 56. Also, it should be understood that the cold air entering the chamber 28 from the duct 49 passes downwardly over the economizer element and the flue elements 85 and 87 and thus is substantially warmed, which, in effect, means that a substantial amount of heat is extracted from the flue gases after they leave the heating element. Also, it will be appreciated that air passing downwardly through the cold air chamber will pass over the outer surface of the wall 30 and since this wall is heated, additional heat will be extracted by the cold air before it enters the blower. Hence, the heating of the air and the circulation thereof is carried on efficiently so as to absorb the maximum amount of heat from the furnace. It is also to be appreciated that by having the one wall of the heating element serve as a partition between the cold and warmed air chambers, that the size of the furnace may be reduced in transverse dimensions, or, in other words, in looking at the structure in Fig. 3, the walls 10 and 11 may be brought closer together. Not only does this result in a saving of metal necessary to build the furnace, but it results in a more compact structure which requires less room and this is highly advantageous for reasons already set forth. Again, by locating the blower below the heating element, less room is required laterally between the walls 10 and 11 as would otherwise be required if the blower were disposed in the cold air chamber or, in other words, to the left of the wall 30 as seen in Fig. 3.

It might be added finally that persons assembling one of the furnaces will have less work to do and less metal cutting due to the arrangement of parts, while still being able to obtain sealed chambers and joints wherever required. In other words, assembling of the furnace requires a minimum of labor and metal cutting.

Fig. 9 shows another form of the invention and in this case the casing of the furnace, indicated generally at 90, has a front compartment 91 having a burner 92, a warmed air chamber 93, and a cold air inlet chamber 94. The chambers 93 and 94 are separated by a wall 95 forming part of a heating unit or element 96 and the lower end of this wall has an opening which fits the discharge end 97 of a blower 98 adapted to force air into the warmed air chamber 93. At its upper end, the heating element 96 is connected to a flue 99, in turn connected to an economizer unit 100, which finally is connected to an exhaust flue 101 extending outwardly of the furnace. Filters 102 are provided in the cold air chamber above the blower and in this case two filters are shown. It may now be observed that cold air entering the cold air chamber passes over the economizer units and flue elements therein, along the partitioning wall of the heating element, through the filters, then through the blower and into the lower end of the warmed air chamber, and then upwardly over the walls of the heating element. The heating element in this case is on the order of that already described in connection with the first form of the invention, in that one wall thereof forms the partition.

Although two forms of the invention have been illustrated and described in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the spirit of the appended claims.

What is claimed is:

1. A furnace comprising a box-like casing having vertically arranged side walls, a hollow metal heater element within the casing and having vertically arranged side walls disposed in spaced relation to the side walls of the casing, vertical flanges projecting laterally from opposite sides of the element and extending substantially to opposite sides of the casing so as to divide the casing but being spaced therefrom and free from metal to metal contact therewith, flexible vertically extending sealing strips on the flanges adjacent their outer edges and projecting laterally beyond such edges into flexible wiping engagement with the casing wall whereby the casing is divided into two vertically arranged chambers, a blower in the bottom of the casing and connecting the lower ends of the chambers, and means for supporting the heating element on the blower housing, the arrangement being characterized by the fact that the assembly of blower housing and heater element with flanges may be assembled with the casing side walls and is supported vertically without any rigid connections between the side walls and flanges.

2. A furnace comprising a box-like casing having vertically arranged side walls, a hollow metal heater element within the casing and having vertically arranged side walls disposed in spaced relation to the side walls of the casing, vertical flanges projecting laterally from opposite sides of the element and extending substantially to opposite sides of the casing so as to divide the casing but being spaced therefrom and free from metal to metal contact therewith, flexible vertically extending sealing strips on the flanges

adjacent their outer edges and projecting laterally beyond such edges into flexible wiping engagement with the casing walls whereby the casing is divided into two vertically arranged chambers, a blower in the bottom of the casing and connecting the lower ends of the chambers, and means for supporting the heater element on the blower housing including a lower plate portion connected to the element and having its lower edge interengaged with the blower housing in such manner that the parts may be engaged merely by lowering the heating element assembly into operative relation with the blower, the arrangement being characterized by the fact that the assembly of blower frame and heater element with flanges may be assembled with the casing side walls and is supported vertically without any rigid connections between the side walls and flanges.

3. A furnace comprising a box-like casing having vertically arranged side walls, a hollow metal heater element within the casing and including a vertical partitioning wall extending cross-wise between two side walls of the casing and substantially into contact with such walls but movable relative thereto so as to divide the casing into two vertically arranged chambers, a blower in the lower part of the casing and having an upwardly open discharge opening for discharging air upwardly into the lower end of one chamber, and means on the lower edge of the partitioning wall releasably engaging an edge portion of the blower defining the discharge opening, said means being of such character that the partitioning wall can be lowered into engagement with such edge portion of the discharge opening and so that the wall is vertically supported by such engagement.

4. A furnace comprising a box-like casing having vertically arranged walls, a partitioning wall in the casing dividing the casing into cold and warmed air chambers vertically arranged in side by side relation, means for heating the air at one side of the partitioning wall, a blower in the lower part of the casing and including a sheet metal housing provided with a discharge opening communicating with the warmed air chamber and an intake opening communicating with the cold air chamber, means on one edge of the partitioning wall sealingly engaging a portion of the housing edge defining the discharge opening, a sheet metal strip extending along and releasably but sealingly engaging the remainder of the housing edge around the discharge opening, and means on such strip having sealing contact with the furnace casing so as in conjunction with the partitioning wall to seal the space around said discharge opening in such manner that cold air can enter the warmed air chamber only through the discharge opening.

5. A furnace comprising a box-like casing having vertically arranged walls, a partitioning wall in the casing dividing the casing into cold and warmed air chambers vertically arranged in side by side relation, means for heating the air at one side of the partitioning wall, a blower in the lower part of the casing and including a sheet metal housing provided with a discharge opening communicating with the warmed air chamber and an intake opening communicating with the cold air chamber, means on one edge of the partitioning wall sealingly engaging a portion of the housing edge defining the discharge opening, a sheet metal strip having a folded side edge releasably embracing the remainder of the housing edge defining the discharge opening, and a

sealing strip connected to the opposite side edge of the strip and having sealing engagement with the casing so as in conjunction with the partitioning wall to seal the space around said discharge opening.

6. In a furnace having a box-like casing, a partitioning wall extending vertically between two opposed side walls of the casing to divide the casing into cold and warm air chambers, a blower in the lower part of the casing and including a sheet metal housing provided with a discharge opening communicating with the warmed air chamber and with an inlet opening communicating with the cold air chamber, said partitioning wall having its vertical side edges spaced from the latter walls, flexible sealing means on the vertical side edges of the partitioning wall and flexibly contacting the casing walls so as to seal the space between the casing side walls and edges of the partitioning wall while allowing quick assembly of the partitioning wall and casing, means on the lower edge of the partitioning wall releasably engaging an edge portion of the discharge opening of the blower, means including a flexible sealing strip sealing the space around the remainder of the edge of the discharge opening so that air can enter the lower end of the warmed air chamber only through the discharge opening, and means for heating air in the warmed air chamber.

7. In a furnace having a box-like casing, a partitioning wall extending vertically between two opposed side walls of the casing to divide the casing into cold and warm air chambers, a blower in the lower part of the casing and including a sheet metal housing provided with a discharge opening communicating with the warmed air chamber and with an inlet opening communicating with the cold air chamber, said partitioning wall having its vertical side edges spaced from the latter walls, flexible sealing means on the vertical side edges of the partitioning wall and flexibly contacting the casing walls so as to seal the space between the casing side walls and edges of the partitioning wall while allowing quick assembly of the partitioning wall and casing, means on the lower edge of the partitioning wall releasably engaging an edge portion of the discharge opening of the blower, a sheet metal element releasably engaging the remainder of the edge of the discharge opening and substantially closing the space around such remaining edge of the discharge opening, and a flexible sealing strip around the outer edge of the element and contacting the casing walls adjacent thereto for sealing said space while permitting ready insertion of the parts into the casing and assembly thereof, and means for heating air in the warmed air chamber.

8. In a furnace having a box-like casing, a partitioning wall extending vertically between two opposed side walls of the casing to divide the casing into cold and warm air chambers, a blower in the lower part of the casing and including a sheet metal housing provided with a discharge opening communicating with the warmed air chamber and with an inlet opening communicating with the cold air chamber, said partitioning wall having its vertical side edges spaced from the latter walls, flexible sealing means on the vertical side edges of the partitioning wall and flexibly contacting the casing walls so as to seal the space between the casing side walls and edges of the partitioning wall while allowing quick assembly of the partitioning wall and

casing, means on the lower edge of the partitioning wall releasably engaging an edge portion of the discharge opening of the blower, means including a flexible sealing strip sealing the space around the remainder of the edge of the discharge opening so that air can enter the lower end of the warmed air chamber only through the discharge opening, and sheet metal means including a part of the partitioning wall forming a box-like heater element for warming the air in the warmed air chamber.

9. In a furnace having a box-like casing, a partitioning wall extending vertically between two opposed side walls of the casing to divide the casing into cold and warm air chambers, a blower in the lower part of the casing and including a sheet metal housing provided with a discharge opening communicating with the warmed air chamber and with an inlet opening communicating with the cold air chamber, said partitioning wall having its vertical side edges spaced from the latter walls, flexible sealing means on the vertical side edges of the partitioning wall and flexibly contacting the casing walls so as to seal the space between the casing side walls and edges of the partitioning wall while allowing quick assembly of the partitioning wall and casing, means on the lower edge of the partitioning wall releasably engaging an edge portion of the discharge opening of the blower, means including a flexible sealing strip sealing the space around the remainder of the edge of the discharge opening so that air can enter the lower end of the warmed air chamber only through the discharge opening, sheet metal means including a part of the partitioning wall forming a box-like heater element for warming air in the warmed air chamber, and a burner fastened to one wall of the casing and communicating with the interior of the heater element for heating it.

10. In a furnace having a box-like casing, a partitioning wall extending vertically between two opposed side walls of the casing to divide the casing into cold and warm air chambers, a blower in the lower part of the casing and including a sheet metal housing provided with a discharge opening communicating with the warmed air chamber and with an inlet opening communicating with the cold air chamber, said partitioning wall having its vertical side edges spaced from the latter walls, flexible sealing means on the vertical side edges of the partitioning wall and flexibly contacting the casing walls so as to seal the space between the casing side walls and edges of the partitioning wall while allowing quick assembly of the partitioning wall and casing, means on the lower edge of the partitioning wall releasably engaging an edge portion of the discharge opening of the blower, means including a flexible sealing strip sealing the space around the remainder of the edge of the discharge opening so that air can enter the lower end of the warmed air chamber only through the discharge opening, and means for heating air in the warmed air chamber, the casing side walls being free from any metallic connection with the edge of the blower opening and side edges of the partitioning wall so that these parts may be readily assembled and inserted in the casing.

11. A furnace comprising a box-like casing hav-

ing vertically arranged side walls, a hollow metal heater element within the casing and having vertically arranged side walls disposed in spaced relation to the side walls of the casing, vertical flanges projecting laterally from opposite sides of the element and extending substantially to opposite sides of the casing so as to divide the casing, sealing means operatively connecting the flanges to the casing walls so that the casing is divided into chambers sealed relative one to the other, a blower in the bottom of the casing and connecting the lower ends of the chambers, and means for supporting the heater element on the blower housing including a lower plate portion connected to the element and having its lower edge interengaged with the blower housing in such manner that the parts may be engaged merely by lowering the heating element assembly into operative relation with the blower.

12. A furnace comprising an outer box-like casing having vertically arranged side walls, a hollow box-type metal heating element disposed within the casing and including partitioning wall portions for dividing the casing into vertically arranged chambers, a blower in the lower part of the casing and having inlet and discharge openings communicating with the lower ends of the chambers respectively for drawing cold air from one chamber and directing it upwardly into the other, a burner unit fastened to one casing wall and communicating with the interior of the heating element for heating the latter, resilient means for sealing the space between the edges of the partitioning wall portions and the opposed side walls of the casing, and resilient means for sealing the space between the edges of the blower discharge opening and the lower end of the chamber with which it communicates, both of said sealing means being of such character that the angularly related walls of the casing may assume a non-rectangular form without interfering with the sealing means sealing one chamber from the other.

13. A furnace comprising an outer box-like casing having vertically arranged side walls, a hollow box-type metal heating element disposed within the casing and including partitioning wall portions for dividing the casing into vertically arranged chambers, a blower in the lower part of the casing and having inlet and discharge openings communicating with the lower ends of the chambers, respectively, for drawing cold air from one chamber and directing it upwardly into the other, a burner unit fastened to one casing wall and communicating with the interior of the heating element for heating the latter, flexible means for sealing the space between the edges of the partitioning wall portions and the opposed side walls of the casing while permitting movement of the casing walls relative to the partition wall, and means for sealing the space between the edges of the blower discharge opening and the lower end of the chamber with which it communicates while permitting movement of the casing walls relative to the blower, both of said sealing means being of such character that the angularly related walls of the casing may assume a non-rectangular form without interfering with the sealing means sealing one chamber from the other.

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