June 2, 1942. C. L. BRYANT 2,285,108

AIR CONDITIONING APPARATUS

Filed July 31, 1939 3 Sheets-Sheet 1

Fig. 1.

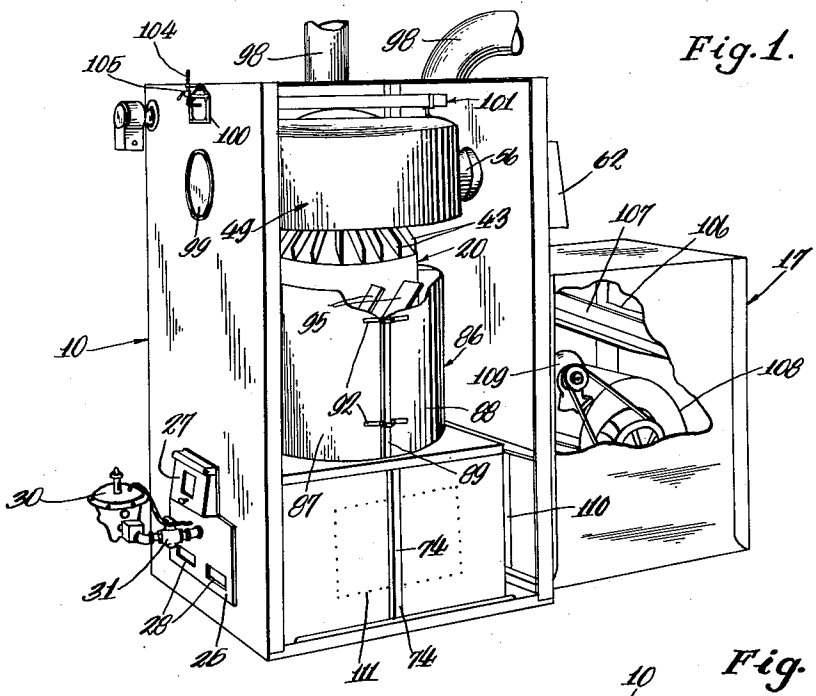
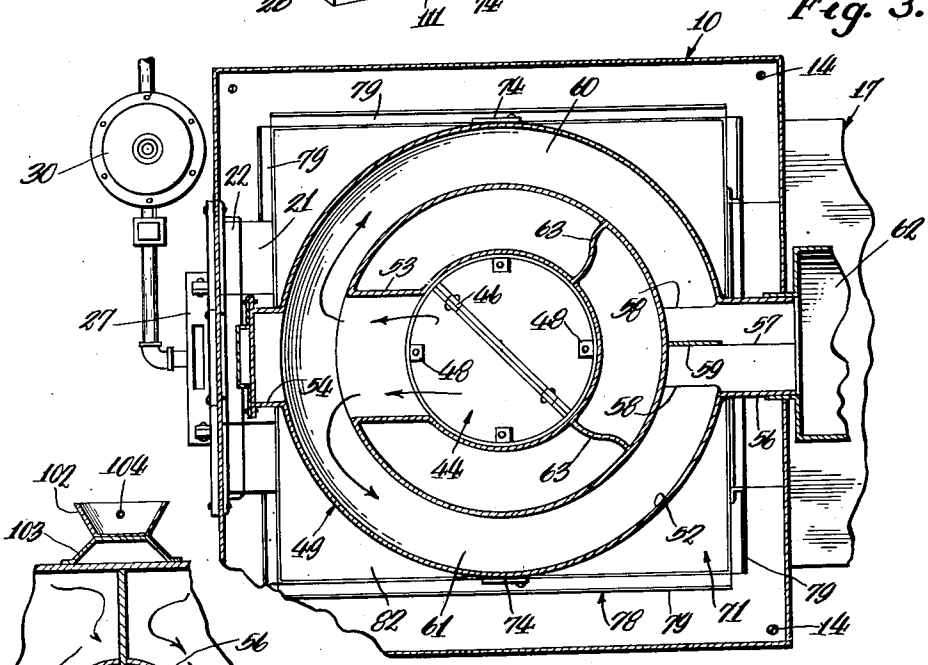


Fig. 3.



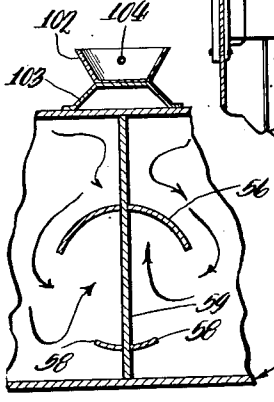


Fig. 4.

Charles L. Bryant
INVENTOR
BY Freeman, Dewart, Cushman and Weidman
ATTORNEYS

June 2, 1942. C. L. BRYANT 2,285,108

AIR CONDITIONING APPARATUS

Filed July 31, 1939 3 Sheets-Sheet 2

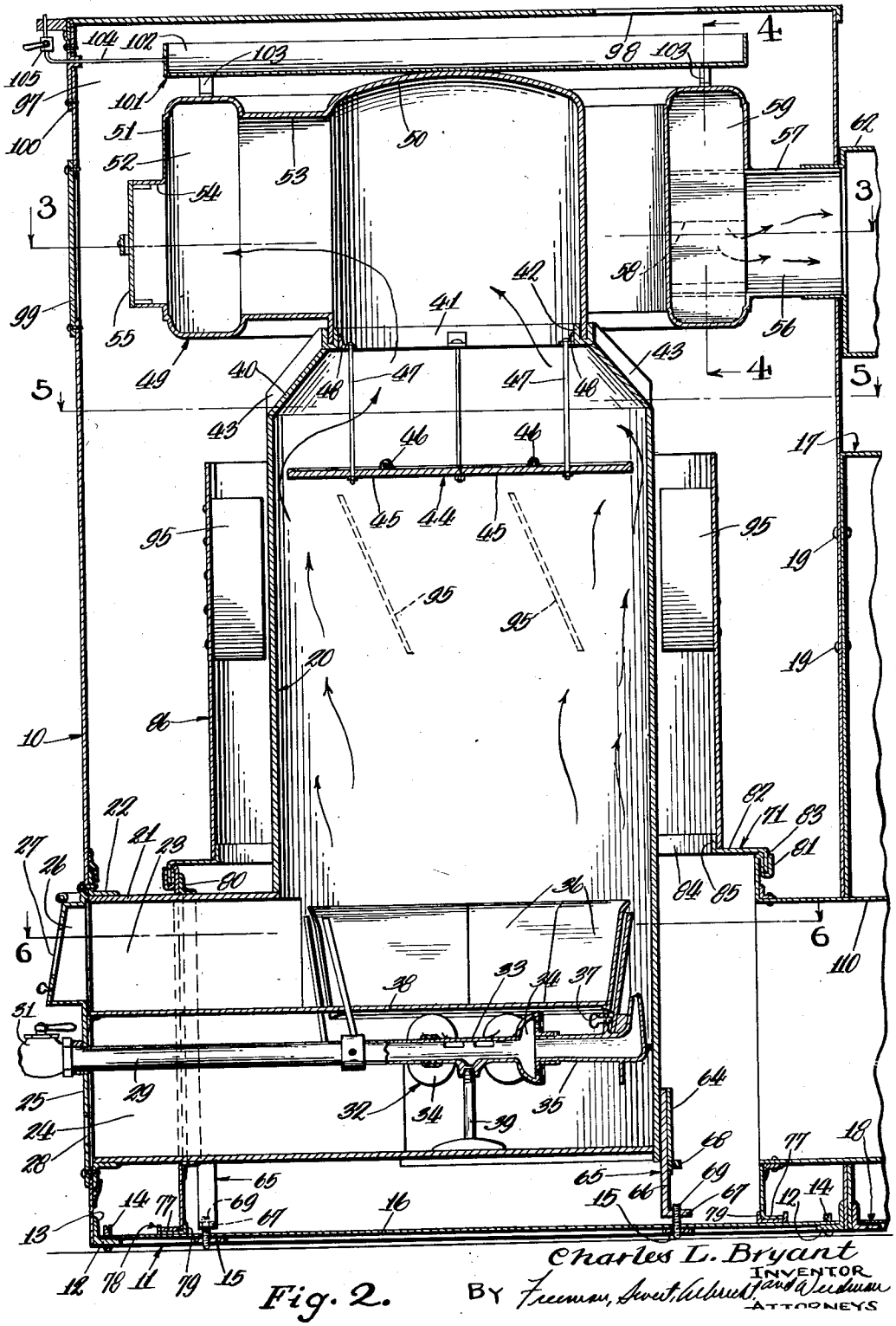


Fig. 2.

Charles L. Bryant
INVENTOR
BY Freeman, Sweet, Albert and Weidman
ATTORNEYS

June 2, 1942. C. L. BRYANT 2,285,108

AIR CONDITIONING APPARATUS

Filed July 31, 1939 3 Sheets-Sheet 3

Fig. 5.

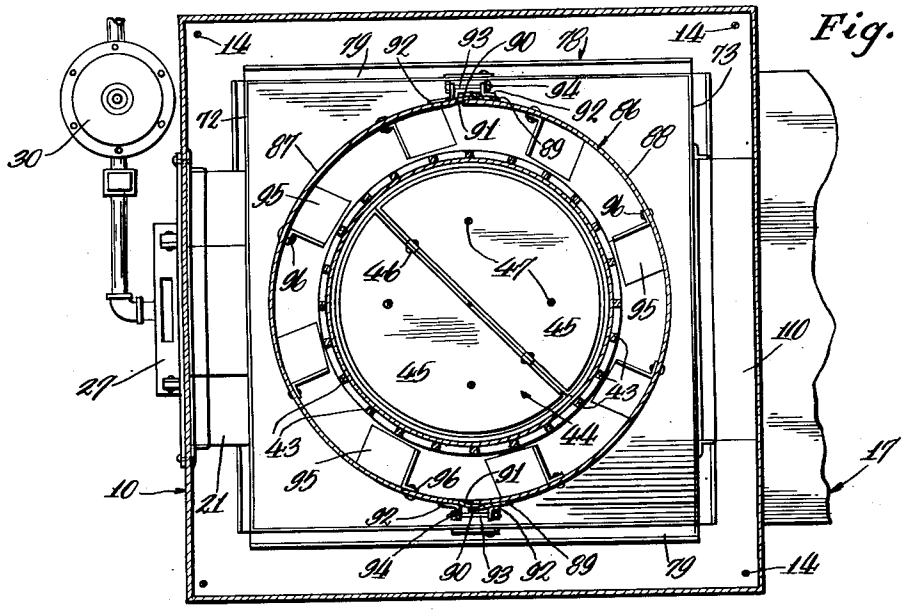
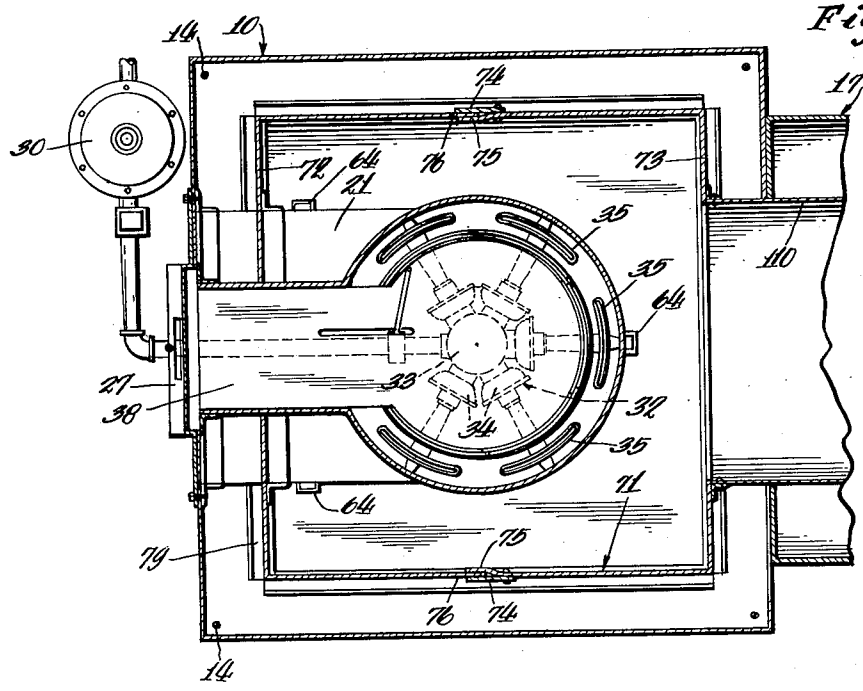


Fig. 6.



Charles L. Bryant
INVENTOR

BY Freeman, Sweet, Albrecht and Wickham
ATTORNEYS

Patented June 2, 1942 2,285,108

UNITED STATES PATENT OFFICE

2,285,108

AIR CONDITIONING APPARATUS

Charles L. Bryant, Cleveland, Ohio, assignor to C. L. Bryant Corporation, Cleveland, Ohio, a corporation of Ohio

Application July 31, 1939, Serial No. 287,572

2 Claims. (C. 126—99)

This invention relates to air conditioning apparatus, more particularly to such apparatus comprising a domestic furnace, and the principal object of this invention is to provide new and improved apparatus of this type. More particularly, an object of this invention is to improve heat transfer in air conditioning apparatus. Other particular objects will appear from inspection of the specification and claims of this application.

In the drawings accompanying this specification, and forming a part of this application, I have shown, for purposes of illustration, one form which the invention may assume, and in these drawings:

Figure 1 is a perspective view of a furnace embodying the invention, certain parts being omitted and certain other parts being broken away to more clearly illustrate the invention,

Figure 2 is an enlarged central longitudinal section, parts being broken away to better accommodate the view to the sheet,

Figure 3 is a horizontal sectional view corresponding generally to the line 3—3 of Figure 2,

Figure 4 is a detail section corresponding generally to the line 4—4 of Figure 2,

Figure 5 is a horizontal section corresponding generally to the line 5—5 of Figure 2, and

Figure 6 is a horizontal section corresponding generally to the line 6—6 of Figure 2.

Referring to the drawings, the construction shown to illustrate the invention comprises an outer casing 10, preferably formed of sheet-metal and rectangular in cross-section. The lower end of the outer casing 10 is open, and is secured to a base 11, preferably formed by connected angle bars 12, each having an upwardly extending flange 13, the combined flanges forming a rectangularly shaped wall over which the lower end of the casing 10 fits, and to which the casing is attached in any suitable manner. Preferably at the four corners of the base 11, screw studs 14 are threaded through the horizontal flange of the angle bars 12, to provide means for leveling the base 11 and the supported furnace construction with respect to a supporting surface, such as the floor of a basement. Cross-strips 15 extend across and are connected to opposite angle strips 12 to reinforce the base 11. A sheet-metal plate 16 may be disposed within the horizontal flanges of the angle bars 12 to close the base 11.

A blower casing 17 is disposed adjacent the outer casing 10, and is supported by its own base 18, which base may be constructed and supported in a manner similar to the base 11, and the blower casing 17 may be detachably secured to a wall of the outer casing 10 as by means of screws or rivets 19 shown in Figure 2.

Disposed within the outer casing 10 is a hollow body 20, forming a heating chamber, the body 20 being here shown as cylindrical, and having a laterally extending pouch 21 at its lower end, the extremity of the pouch being secured to the front wall of the outer casing by means of angle bars 22 which are connected to the pouch and to the casing. The front wall of the outer casing 10 is formed with an aperture to correspond to the cross-sectional contour of the pouch 21. The contour of the pouch 21 in this case is generally similar to an inverted block-letter T, forming a relatively narrow upper chamber 23, and a relatively larger lower chamber 24, the two chambers communicating with each other and communicating with the heating chamber formed by the body 20. A plate 25, corresponding generally in shape to the cross-sectional contour of the pouch 21, overlies and closes the aperture formed in the front wall of the casing 10, and provides an inspection opening 26 closed by a hinged door 27, and also air openings 28, which may if desired, be controlled by movable shutters (not shown). The plate 25 also has an opening for the fuel pipe 29, a suitable fuel regulator 30 and a fuel control valve 31 being interposed in the fuel pipe 29, exteriorly of the outer casing 10, for the purpose of regulating and controlling the fuel from a source of supply to a burner device 32 disposed within the hollow body 20.

The burner device 32 may be of any suitable form, but is preferably of the form shown in my co-pending application Serial Number 74,929, filed April 17, 1936, now Patent No. 2,190,708, issued February 20, 1940. Briefly, the burner device 32 comprises a cylindrical manifold body 33, connected to the fuel pipe 29, and provided with a plurality of integral mixing chambers 34, here shown to extend radially from the manifold body 33. A burner 35 is connected to each mixing chamber 34, and has its burner outlet positioned adjacent the wall of the body 20. A plurality of interlocked baffle members 36 are supported by the burners 35, each baffle member 36 being chambered, so that secondary air may pass through such chamber and be delivered to the products of combustion rising from the outlet of a respective burner 35. Each baffle member 36 is formed with a ledge 37, upon which rests a sheet-metal plate 38 which extends to the terminating end of the pouch 21, as best seen in Figures 2 and 6. The entire burner device 32 is

supported by an adjustable foot 39, connected to the manifold body 33, and resting on the inner surface of the lower wall of the body 20, as best shown in Figure 2.

The upper end of the body 20 is provided with an integral conical portion 40 which tapers inwardly to an exhaust opening 41 of the body 20, the exhaust opening being defined by an annular U-shaped channel 42. The conical portion 40 is formed with radially extending ribs 43, the ribs 43 providing for additional radiation of heat from the body 20.

A baffle means 44 is positioned adjacent the exhaust opening 41 of the body 20, and as here shown, comprises a disk formed in halves 45, the halves having matching lugs 46. Nut and bolt connections pass through apertures in the lugs 46 for the purpose of holding the halves 45 connected. A plurality of hanger rods 47 engage the baffle means 44, the upper end of each hanger rod 47 being supported by an angle piece 48 secured to the U-shaped channel 42. It will be obvious that the baffle means 44 may be removed through the exhaust opening 41 of the body 20, by disconnecting the halves 45, and then disconnecting the hanger rods 47 from the halves 45, and removing the halves through the exhaust opening 41. Assembly of the baffle means 44, of course, can be effected by a reverse operation.

Supported from the top of the body 20 is a radiator means 49, here shown as comprising a cylindrical hollow body 50, open at its lower end, the cylindrical wall defining the open lower end being disposed within the annular channel 42, as best seen in Figure 2. Suitable fastening means (not shown) may be provided to rigidly hold the radiator means 49 assembled with the body 20. Encircling, but spaced from the cylindrical body 50, is an annular ring-shaped member 51, providing an annular chamber 52. A radially extending conduit 53 provides communication between the interior of the cylindrical body 50 and the chamber 52. The annular member 51 is provided with a clean-out opening 54 in its outer wall, the opening being closed by a removable cover 55. The outlet of the chamber 52 is diametrically opposed to the conduit 53, and comprises a conduit 56 diametrically split as shown at 57, in Figure 3, the conduit extending from the inner defining wall of the chamber 52 completely across the adjacent portion of the chamber 52, and outwardly some distance from the outer defining wall of the chamber 52. The conduit 56, interiorly of the chamber 52, is formed with openings 58, the combined area of the two openings shown being substantially equal to that cross-sectional area of the conduit 56 which is disposed exteriorly of the annular member 51. A divider plate 59 is clamped between the split margins of the conduit 56, the margins being recessed to accommodate the thickness of the plate 59. The divider plate 59 is of such outline as to closely fit the defining wall of the adjacent portion of the chamber 52, as best seen in Figure 2, thus dividing the chamber 52 into two semi-annular conduits.

In the construction described, the products of combustion rising from the outlets of the burner 35 are caused to spread toward the walls of the body 20, by reason of the position of the baffle means 44, and such rising products of combustion pass outwardly through the exhaust opening of the body 20, into the cylindrical chamber formed by the body 50, and from this chamber through the radially extending conduit 53 to the chamber 52, and at this point the products of combustion are divided, so that one portion passes along one semi-annular conduit 60 of the chamber 52, and the other portion passes along the other semi-annular conduit 61 of the chamber 52, the portions passing through respective openings 58, and meet again in the outer portion of the conduit 56, and from there pass to a draft hood 62 and then to a suitable exhaust, such as a chimney (not shown). Referring particularly to Figure 4, it will be seen that the openings 58 in the conduit 56 are located adjacent the lower portion of the chamber 52, so that the products of combustion in the upper portion of the chamber 52 are caused to move in a downward direction indicated by the arrows in Figure 4, before escaping through the conduit 56. Because of the particular size of the openings 58, a baffle effect is produced, preventing the products of combustion from too rapidly escaping from the chamber 52, and thus providing for the utilization of substantially all the heat energy in the products of combustion. The annular member 51 may be further supported from the cylindrical body 50 by means of webs 63, which may be curved as best shown in Figure 3, and these webs also provide radiating surfaces.

The lower end of the body 20 is supported from the base 11 in spaced relation, and as here shown, the means to accomplish such spacing comprises a plurality of sockets 64 carried by the body 20 at its lower end. In this particular case, three sockets 64 are provided, two on opposite sides of the pouch 21 and one at the rear center of the body 20. The sockets 64 are preferably formed of U-shaped channels which are welded to the body 20. Support means 65 cooperate with the sockets 64, and as shown each support means comprises a leg portion 66, and an integral foot portion 67. The leg portion 66 fits into a respective socket 64 and is formed with a ledge 68, which may be a separate piece welded to the leg 66, the ledge engaging the lower end of the socket 64 and holding the lower end of the body 20 spaced from the base 11. Each foot portion 67 is apertured to freely pass a screw stud 69, the screw stud also freely passing through an aperture in the closure plate 16, and engaging the threads of a screw-threaded aperture formed at a proper place in the cross-pieces 15. The lower end of each screw stud 69 is adapted to engage the supporting surface, such as the floor, and thus it will be obvious that any sagging of the cross-pieces 15, or sagging of the base 11, may be taken care of by properly adjusting the screw studs 69.

Surrounding the lower end of the body 20 is an air-box means 71, preferably rectangular in cross-section as best shown in Figure 6. The side defining wall of the air-box means 71 is preferably formed in halves 72, 73, the respective vertical terminating margins of the halves being in juxtaposed relation. Strips 74 are riveted or otherwise suitably secured along the vertical terminating margins of the half 73, and each margin has a portion 75 bent out of the plane of the margin and cooperating with a respective strip 74 to form a longitudinally extending socket for receiving the adjacent vertical terminating margin 76 of the other half 72, and thus provide an air-tight joint. The lower end of the air-box means 71 is open, and the terminating horizontal margins of the halves 72, 73 are bent laterally and outwardly to form a foot 77 extending around the lower end of the air-

box means. The foot 77 fits within a track 78 formed by four channel bars 79 secured to the base 11 in proper position to receive the lower end of the air-box means 71, and in this manner the lower end of the air-box means is substantially sealed against air leaks. The wall half 72 is formed with an opening to pass the pouch 21 of the body 20, an asbestos flap 80 being secured to the wall half and so positioned about the pouch as to seal the opening in the wall half 72 against air leaks.

The upper end of the air-box means 71 is also open, and the upper horizontal terminating margins of the wall halves 72 and 73 are bent to provide U-shaped channels 81, as best seen in Figure 2. A cover member 82 has a downwardly extending flange 83 fitting into the U-shaped channel 81, in air-tight relation. The cover member 82 has an opening 84 defined by an upwardly extending annular flange 85, and fitting about the flange 85 is a cylindrical casing 86, concentric with but spaced from that part of the body 20 which extends outwardly from the air-box means 71. The upper end of the cylindrical casing 86 is open and terminates slightly below the conical wall 40 of the body 20. The casing 86 is preferably made in sections, to facilitate assembly and removal of the casing, and as shown, is formed in two halves 87 and 88, the vertical terminating margins of which are in juxtaposed relation. Strips 89 are riveted or otherwise suitably secured along the vertical terminating margins of the half 88, each strip having a portion 90 bent out of the plane of the strip and cooperating with a respective terminating margin to form a longitudinally extending socket for receiving the adjacent vertical margin 91 of the half 87. Pairs of angle pieces 92 are secured to the halves 87, 88, on opposite sides of their longitudinal connections, a bolt 93 passing through apertures in each pair of angle pieces 92, and having a nut 94 threaded thereon, the nut and bolt connection holding the halves assembled to form the casing 86. It will be appreciated that because of the nut and bolt connections, the halves 87, 88 are readily assembled and disassembled.

Adjacent the upper extremity of the casing 86 means is provided to cause the air moving through the casing 86 to move laterally as it moves longitudinally. As herein shown, this means comprises a plurality of vanes 95 extending radially inwardly of the casing 86 just short of engagement with the wall of the body 20, each vane having a foot portion 96 riveted or otherwise secured to the wall of the casing 86. Each vane 95 is positioned at an angle to he longitudinal axis of the casing 86, as best seen in Figure 2, so that air passing through the casing 86 is caused to swirl during such passage, so that this air is brought into contact with a considerable area of the outer surface of the body 20. The air leaving the upper open end of the casing 86 comes into contact with the radiator means 49 and the fins 43 on the body 20, and also with the webs 63, and picks up additional heat, and passes to the bonnet chamber 97 at the upper end of the outer casing 10, from where it may be drawn off by suitable riser conduits 98, shown in Figure 1, to the area to be heated.

The outer casing 10 is provided with an opening normally closed by a cover 99, this opening being in line with the clean-out opening 54 of the radiator means 49, so that access may be had to the clean-out opening. Immediately above the opening closed by the door 99 is another opening closed by a door 100, this latter opening providing access to the interior of the extreme upper end of the outer casing 10, for the purpose of introducing or removing a humidifying device 101 from the bonnet chamber 97. The humidifying device 101 comprises an elongated pan 102 of relatively narrow width, having legs 103 adjacent its ends, the legs resting on the top of the radiator means 49. The pan 102 has a connection with a conduit 104 extending exteriorly of the casing 10, and communicating with a source of water supply, a valve 105 being interposed in the conduit 104 for regulating the supply of water to the pan 102. An overflow conduit (not shown), may be provided if desired.

The blower housing 17 may have an inlet opening in its upper or side wall, the inlet opening 106 being shown in the side wall, and filter screens 107 are so positioned that the air entering the inlet opening must pass through the filter screens 107. A blower 108 is positioned within the housing 17, and is driven by means of an electric motor 109. A conduit 110 is connected to the outlet of the blower 108, and as here shown the conduit 110 passes through an opening in the rear wall of the casing 10, and is secured to a wall of the half 73 of the air-box means 71, the air-box means being apertured at this place so that air may pass from the conduit 110 to within the air-box means 71.

From the foregoing it will be apparent that air is drawn into the blower casing 17 by the blower 108, this air being filtered by the filtering means 107, and is expelled with predetermined velocity through the conduit 110 and into the air-box means 71. This air will entirely surround the lower end of the body 20, and since the lower end of the body 20 is spaced from the base 11, heat will be transferred from the lower end of the body 20 to the air, instead of being conducted or radiated to the base 11 and surrounding parts of the surface supporting the base 11. From the air-box means 71, the air moves upwardly into the casing means 86 around the body 20, the vanes 95 causing this air to swirl about the body 20 and come into wiping contact with a greater part of this body, the air emerging from the upper open end of the casing 86, and contacting the fins 43 and the radiator means 49, picking up additional heat during its travel to the bonnet chamber 97 and to the riser conduits 98, the humidifying device 101 supplying a proper amount of moisture to the air delivered to the bonnet chamber 97.

In some installations, it is more convenient to have the blower 108 and its casing 17 at a side of the furnace, instead of at the rear as shown in the drawings. Since each installation depends to a certain extent upon the space available for the furnace, it has been found advantageous to provide the air-box means with only an opening for the pouch 21, the other side walls being closed but formed with punch marks 111 outlining the position and the size of the opening required for the blower conduit 110. In such case, the person installing the furnace may first determine the desired position of the blower casing 17, and then cut along the punch marks 111 in the corresponding side wall of the air-box means 71, so that the opening for air from the conduit 110 is at the proper place.

It will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention, and it also will be ap-

parent to those skilled in the art that the embodiments herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim:

1. Air conditioning apparatus, comprising: air-box means, having air inlet and air outlet opening means; a hollow body, forming a heating chamber, having one end disposed within said air-box means, and its other end extending outwardly through the outlet opening means of said air-box means, said one end being of smaller cross-sectional extent than the chamber provided by said air-box means, providing an air-box air space, and said outwardly extending end being spaced from the defining margin of said outlet opening means; inner casing means, circumscribing, in spaced relation, that part of said body which extends outwardly of said air-box means, and constructed and arranged to provide an air chamber about said body, said air chamber providing an air space of cross-sectional area less than said air-box space, so that air from said air-box means is accelerated in its movement through said air chamber; vane means, disposed within said air chamber, secured in heat conducting relation to said inner casing, and so constructed and arranged that air passing through said air chamber is caused to move transversely of said air chamber as it passes longitudinally through said air chamber; and outer casing means, generally housing the aforementioned means, and having duct means for conveying heated air to a place to be heated, and providing an enlarged air space with respect to the outlet of said air chamber, so that air flow is decelerated after passage from the outlet of said air chamber.

2. Air conditioning apparatus, comprising: means forming a heating chamber; a casing construction, enclosing at least the lower portion of said heating chamber means, and having an opening for admission of air to be heated, said casing construction being spaced from all surfaces of said lower portion to form an air circulation space along the bottom and sides of said heating chamber means; vane means, disposed in said air space between said sides of said heating chamber means and said casing construction, secured in heat conducting relation to said casing construction, and so constructed and arranged that air rising upwardly in said air space is caused to move both longitudinally and circumferentially through said air space and along the sides of said heating chamber means; and casing means, generally housing said casing construction.

CHARLES L. BRYANT.