Oct. 27, 1953 B. SPIETH 2,656,780

CONVECTION HEATER

Filed March 15, 1948 4 Sheets-Sheet 1

Fig. 1

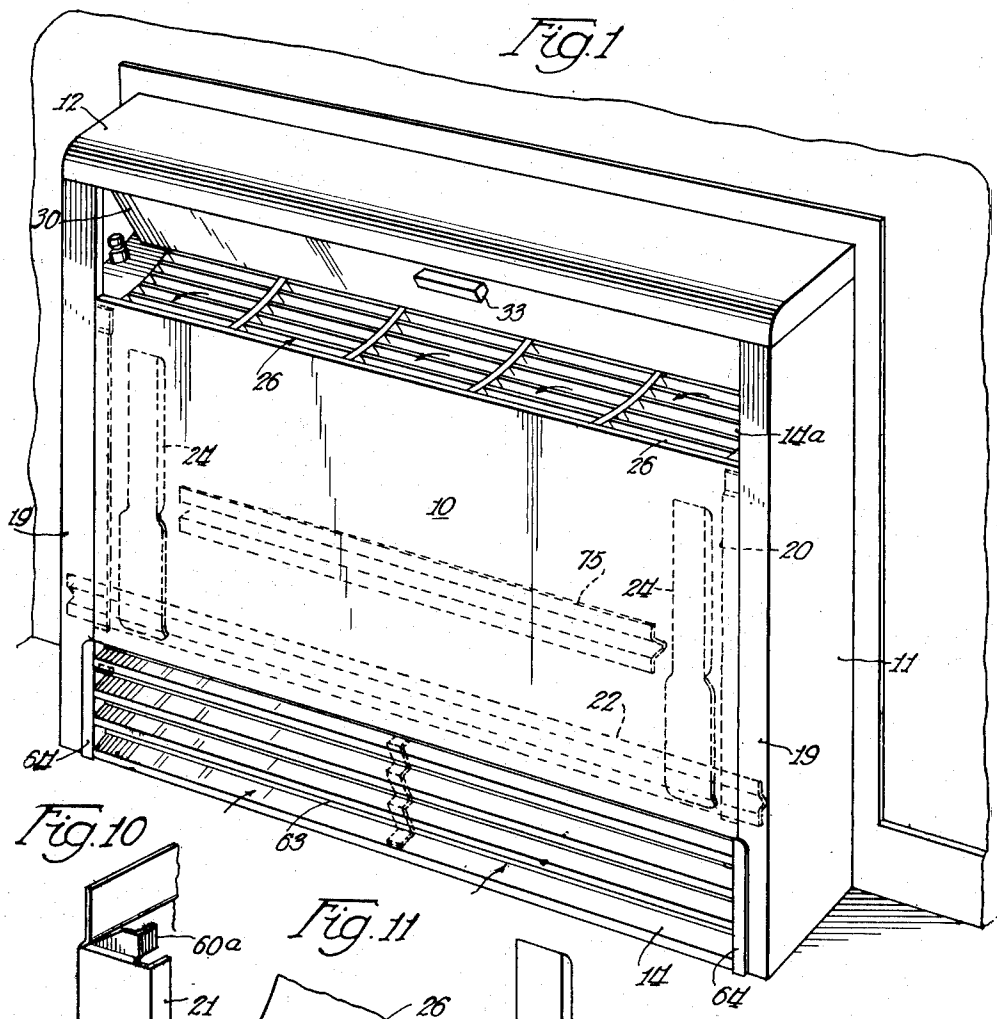


Fig. 10

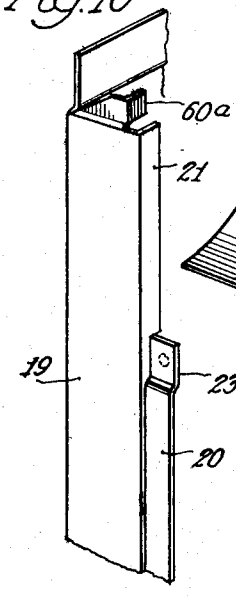


Fig. 11

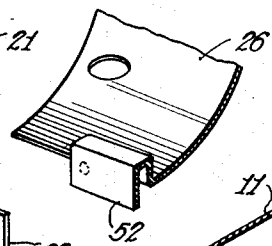
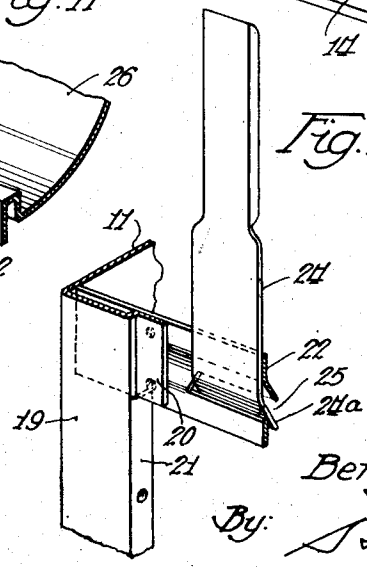


Fig. 12



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CONVECTION HEATER

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Fig. 2

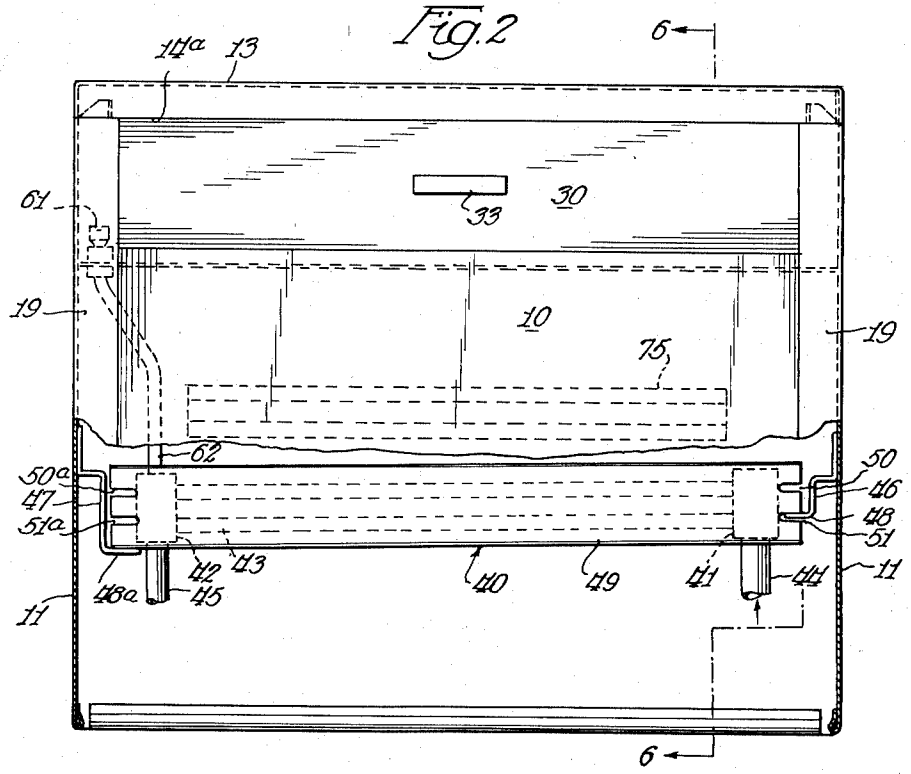


Fig. 4

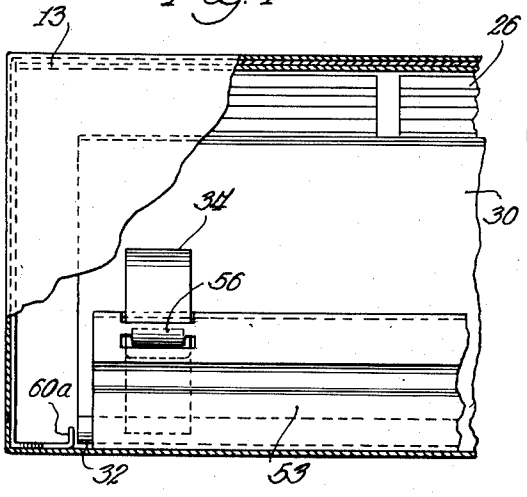
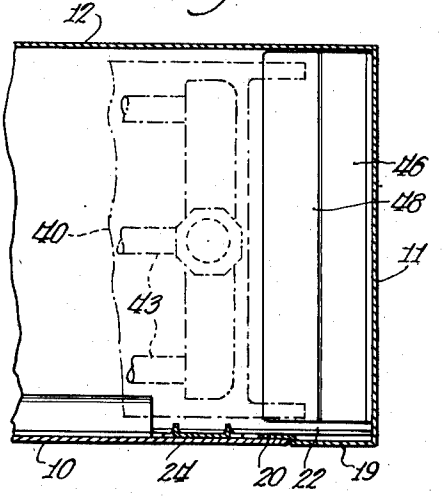


Fig. 5



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CONVECTION HEATER

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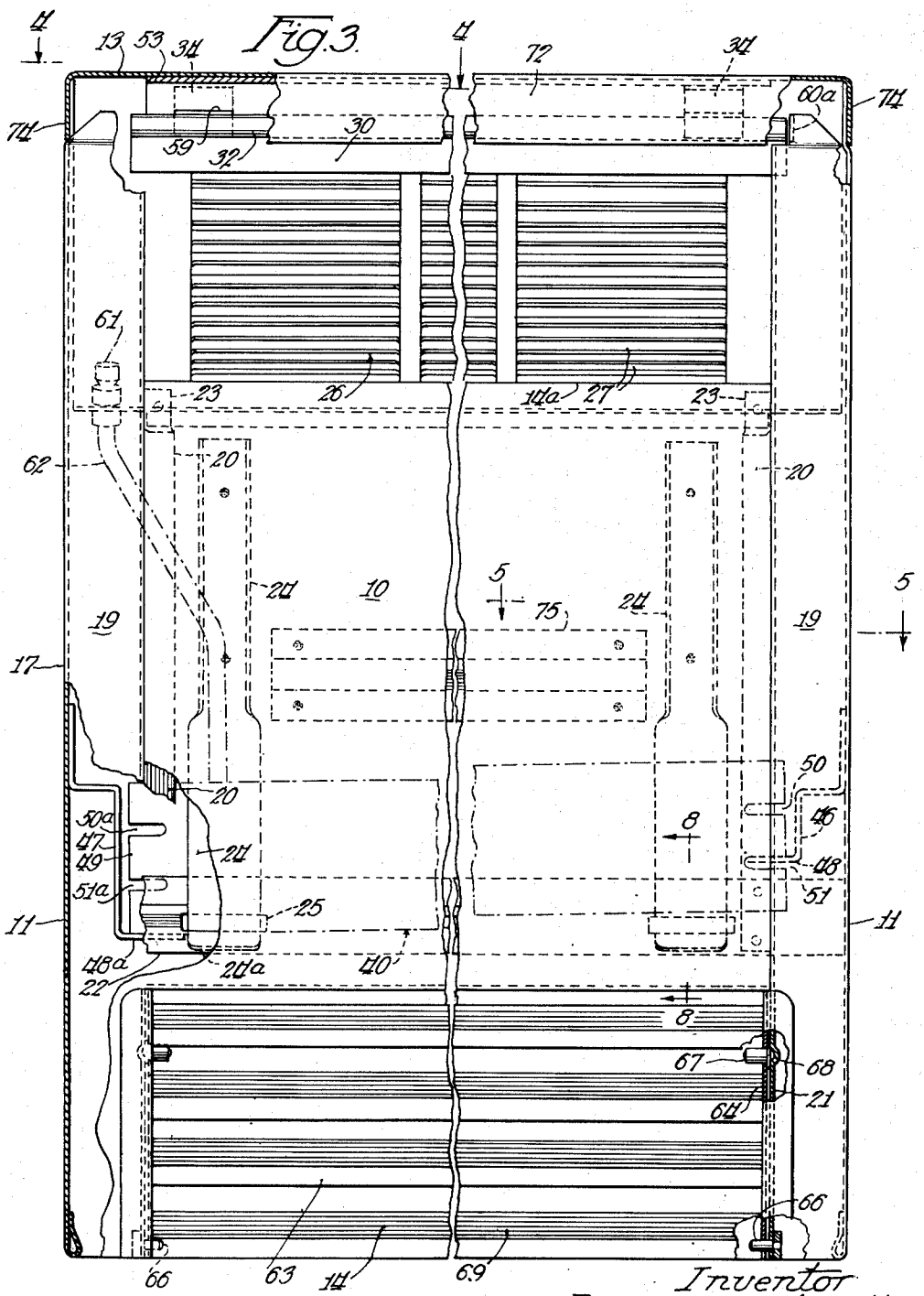
Fig. 3.



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CONVECTION HEATER

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Fig. 6.

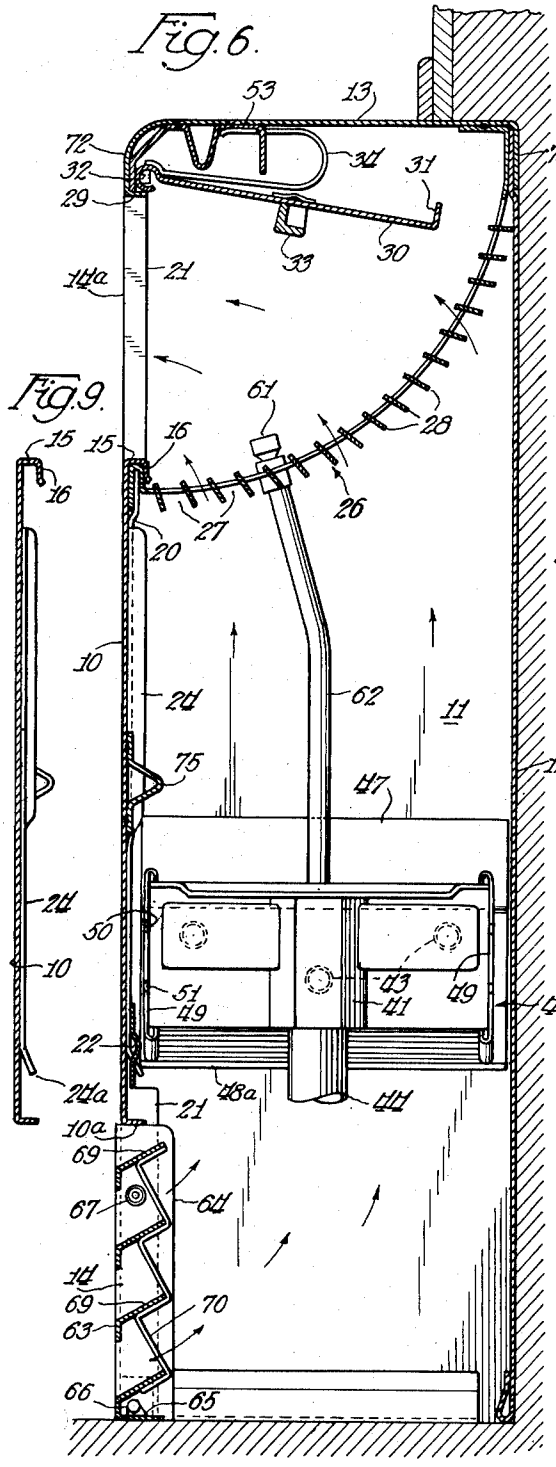


Fig. 9.

Fig. 7.

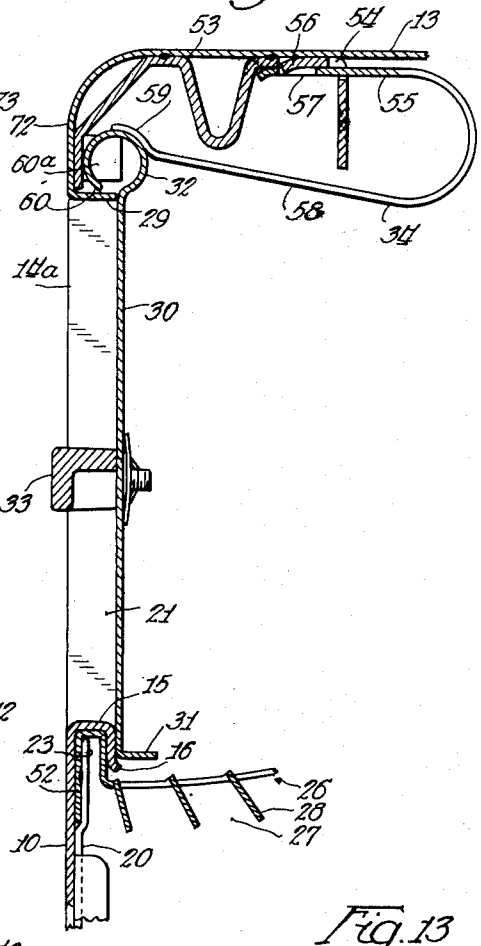


Fig. 13

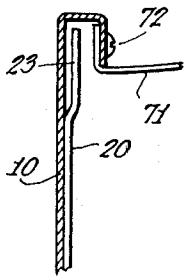
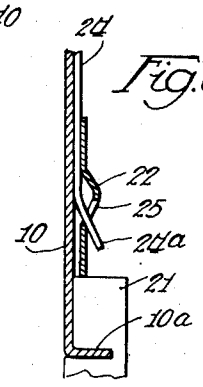


Fig. 8



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Patented Oct. 27, 1953

2,656,780

UNITED STATES PATENT OFFICE

2,656,780

CONVECTION HEATER

Benjamin Spieth, Racine, Wis., assignor to Modine Manufacturing Company, Racine, Wis., a corporation of Wisconsin

Application March 15, 1948, Serial No. 14,968

11 Claims. (Cl. 98—40)

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This invention relates to a convection heater and the like.

One object of the invention is to provide a cabinet having an air inlet opening at its bottom and a hot air outlet opening at its top, together with a heating element disposed adjacent the air inlet opening of the cabinet and adapted to heat air passing upward through the cabinet.

Another object is to provide a convection heater that can be constructed economically using modern factory production methods, and with a minimum number of parts and one that is highly efficient in operation.

Another object is to provide a cabinet as part of a convection heater unit, pleasing in appearance and conforming to modern styles in home architecture.

Another object is to provide a cabinet construction adaptable to conditions of "free standing" in a room, or to be partially, or almost wholly recessed into a wall, and the design is such that when the cabinet is recessed into a wall, the recess may be trimmed in a simple fashion.

Another object is to provide a design of cabinet outlet grille which automatically increases in area, as the depth of cabinet is increased, thus permitting full flow of convected air without unnecessary restriction. This is desirable in order to obtain full capacity as the cabinets increase in depth and which is impossible when a single size outlet grille is used for all depths of convector assemblies, as in the usual design.

Another object is to provide a cabinet which permits of easy access to the air vent of hot water heating units, which access is ordinarily troublesome and unsightly.

Another object is to provide a cabinet incorporating a damper so arranged to permit varying amounts of convected air to flow as the requirements for heat may vary.

Another object is to provide a cabinet incorporating a damper so arranged that the outlet grille is completely hidden from view when the damper is closed during periods of no heat requirement.

Another object is to provide a cabinet incorporating a front panel easily removable without tools so that interior of cabinet may be quickly accessible for cleaning, inspection of parts, installation, etc.

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Another object is to provide a cabinet incorporating a tie strap which maintains the end panels of the cabinet at a predetermined spacing and dimension which simplifies installation, and makes for neatness and satisfaction of job.

Another object is to provide a cabinet incorporating a removable grille of pleasing design that will hide or camouflage the lower or inlet air opening.

Another object of my invention is to provide a convector cabinet with provisions for locating the heating element at a proper height and provide the necessary "pitch" to the heating element in either direction without use of bolts, nuts, loose pieces, etc. and without the use of any tools.

With these and other objects and advantages in view, this invention consists in the several novel features of construction, arrangement and combination of parts hereinafter fully set forth and more particularly defined in the apended claims.

The invention is clearly illustrated in the drawings accompanying this specification, in which:

Fig. 1 is a perspective view of a convection heater embodying one form of the present invention;

Fig. 2 is a front elevation of the convection heater with its front panel partly broken away to show the heating element and its supports, part of the end panels being shown in section;

Fig. 3 is a front elevation of the convection heater with the central portion thereof broken away and part of the front panel broken away, portions of the cabinet being shown in section;

Fig. 4 is a view partly in plan and partly in horizontal section taken on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 3;

Fig. 6 is a vertical cross section taken on the line 6—6 of Fig. 2;

Fig. 7 is a detail enlarged vertical cross section illustrating a certain damper and grille;

Fig. 8 is an enlarged vertical cross section taken on the line 8—8 of Fig. 3;

Fig. 9 is a vertical cross section taken through the front panel;

Fig. 10 is a fragmental perspective view of one end panel of the cabinet;

Fig. 11 is a fragmental perspective view of the grille;

Fig. 12 is a perspective view of a fragment of an end panel and illustrating a certain tie strap and locking means for the front panel; and

Fig. 13 is a fragmental vertical cross section illustrating a modified form of connection between the front panel and grille.

Referring to said drawings which are merely illustrative of one embodiment of the invention, the reference character **10** designates the front panel, **11**, **11** the end panels, **12** the back wall and **13** the top member of the convection heater cabinet.

The top member is preferably formed with downturned front and rear flanges **72**, **73** and side flanges **74**. The side and rear flanges overlap the end panels and rear wall respectively, and the upper ends of said end panels and rear wall are offset inwardly to permit the end panels and rear wall to be flush with the flanges. The end flanges and end panels are spot welded together and the rear flange and back wall may also be spot welded together.

The front panel is of less height than the cabinet, and its lower edge is disposed above the bottom of the cabinet, whereby an air inlet opening **14** is left below the lower edge of the front panel and an air outlet opening **14***a* is left between the upper edge of the panel and the top member **13**.

On the lower edge of the front panel may be formed an inwardly directed flange **10***a* and at the uper edge of the front panel may be provided an inwardly directed flange **15** terminating in a downturned flange **16**, thus providing a hook-like arrangement at the top of the front panel by which the front panel is suspended. A metal bar **75** spot welded to the rear face of the front panel is provided for reenforcing the same.

The front edge portions of the end panels are formed with vertical flanges **19** which project toward the front panel and serve as pilasters that add to the attractive appearance of the cabinet. The inner edge portions of the flanges **19** are offset rearwardly as at **20**, with the side edge portions of the front panel contacting therewith and being firmly and removably pressed against them. At the air inlet and air outlet openings, the edge portions of the flanges **19** are bent back into the interior of the cabinet as at **21** for the purposes of appearance and to give rigidity to the flanges **19**.

A tie strap **22** welded or otherwise secured to the end panels extends behind the front panel and ties the two end panels together, thereby preventing any spreading or converging of the front ends of the end panels. The front panel may be suspended by flanges **23** which extend up from the offset flanges **20**, or it may be suspended from a grille **26** as will be hereinafter explained. formed upright strips **24** (see Fig. 12) spot welded or otherwise secured to the rear face of the front panel are provided at their lower ends with inclined tongues **24***a* which project through slots **25** formed in the tie strap and hold the front panel tightly in place against the flanges **20**. To insert the tongues **24***a* into the slots **25**, the lower portion of the front panel is held outwardly a sufficient distance to permit the tongues **24***a* to enter the slots **25**, after which, the front panel is lowered, the inclined faces of the tongues serving to wedge the front panel against the flanges **20**.

In the upper end of the cabinet behind the air outlet opening is the grille **26** which is preferably of arcuate form struck from a common center. The grille extends across the space between the upper edge of the front panel and the back wall, from the top of the front panel to the top or back wall of the cabinet. The lower or forward edge of the grille is bent up into the U-bend as seen at **52** in Fig. 7, and said U-bend is hooked over the top of the flanges **23** and is spot welded thereto, if desired. The upper or rear end of the grille is spot welded to the top member **13** of the cabinet. The grille is formed with air outlet openings preferably in the form of slots **27** (see Fig. 6), which slots extend longitudinally of the grille. From one edge of each slot an air deflector strip or vane **28** projects into the part of the cabinet below or behind the grille; said vanes extend longitudinally of the grille and all incline in a direction toward the air outlet opening so as to direct the flow of hot air rising in the cabinet toward the air outlet opening. If desired, the vanes may radiate from a common center.

Swingably mounted on an inturned horizontal flange **29** of the top member **13** (see Fig. 7) is a swingable damper **30** desirably formed of sheet metal having an inturned flange **31** at its lower edge. Its upper edge portion is curled into an incomplete cylinder **32** which rests on the flange **29**. U-shaped springs **34** carried by a metal strip **53** of irregular cross section welded or otherwise secured to the top member engage the incomplete cylinder **32** of the damper and hold it upon its seat. The irregular strip **53** is formed with notches **54**, through which one arm of each spring **34** may extend so as to lie underneath the top member of the irregular strip, which is formed with spring detents **56** that engage in a slot **57** in the arm **55** of each spring. The end of the other arm **58** is curled into a segment of a cylinder **59** which is spring pressed against the incomplete cylinder **32** of the damper. The tension of the springs is ample to hold the damper in any position of adjustment. Because of the gap in the incomplete cylinder, as the damper approaches its final closing position, the edge **60** of the incomplete cylinder rides upon the flange **29** permitting the entire damper to lower slightly, whereby it is held in positively closed position without any danger of chattering. To prevent endwise movement of the damper, the upper ends of the flanges **19** of the end panels are formed with transverse flanges **60***a* (see Fig. 4), which extend across the ends of the incomplete cylinder of the damper. When closed, the damper covers the entire air outlet opening. Usually the damper is closed when the heater is not in operation, but when in operation, the damper is swung into a more or less open position to permit a greater or lesser amount of hot air, as is required, to be discharged into the room in which the heater is installed. A handle **33** secured to the damper provides means to facilitate opening and closing the same.

A suitable heating element **40** is supported in the interior of the cabinet above the air inlet opening **14**. A heating element of the type shown and described in my application for Letters Patent on Heating Element for Convection Heaters, Serial No. 776,363, filed September 26, 1947, is an example of a highly efficient heating element useable in the present convection heater. Briefly, the heating element shown comprises an inlet header **41** (see Fig. 2), an outlet header **42** and finned tubes **43** connecting said headers. The inlet header is connected to a supply pipe **44** for steam or hot water, and the outlet header is connected to a discharge pipe **45**. If required, an air

valve 61 may be connected to the heating element by a pipe 62.

Suitable means are provided for supporting the heating element in the cabinet. As shown, there are two dis-similar brackets 46, 47 spot welded or otherwise secured to the end panels, each bracket having a supporting flange 48 or 48a projecting toward the interior of the cabinet. The heating element is provided with side plates 49 formed in their ends with upper and lower notches 50, 51 at one end and 50a, 51a at the other end. When the heating element is assembled into place in the cabinet by a mechanic, the heating element is positioned so that the projecting flange 48 of the bracket 46 may enter one pair of notches 50 or 51 as necessary at the right hand end of the heating element. The heating element is then moved to the right as far as it will go and the left hand end will then drop into place with the side plates resting on the flanges 48a of the bracket 47.

If the mechanic wishes the heating element to pitch upward to the right he will assemble the lower notches 51 with the flange 48, or, if he wishes the heating element to pitch downward toward the right he will use the upper notches 50. Thus, provision is made for properly pitching the heating element for draining of condensed steam in steam installations, or for entrained air of hot water installations to flow to the proper end of the heating element for eventual discharge.

If desired, the air inlet opening 14 may be provided with a grille 63 removably secured to the end panels of the cabinet. One form of grille may comprise upright angle plates 64 having notches 65 in their lower edges in which are received pivot pins 66 upon which the grille 63 may be pivotally supported. In the upper end of the angle plates are secured spring urged buttons 67 which snap into sockets 68 formed in the flanges 21 when brought into register with the sockets.

Secured to and extending between the angle plates are louvres 69 which incline upwardly and rearwardly to direct the incoming air in a more or less upward direction. A metal strip 70 secured to the underside of the louvres midway between their ends reenforces the louvres.

In the modified form of the invention illustrated in Fig. 13, the front panel 10 may be suspended on the flanges 23 as in the preferred form. The forward edge of the grille 71 may be formed integral with the front panel or it may be detachably secured thereto by screws and nuts 72, so that if it becomes necessary to obtain access to the interior of the cabinet the screws may be removed and the front panel removed by disengaging it from the flanges 23 and tie bar 22.

The cabinet is adaptable to conditions of "free standing" in a room or to be partially or almost wholly recessed into a wall. In the drawings the cabinet is shown as partially recessed into a wall, with a trim surrounding the top member and end panels of the cabinet.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. A convection heater comprising in combination, a cabinet having a front panel, end panels, a back wall and a top member, the front panel being of less height than the cabinet with its lower edge spaced from the bottom of the cabinet to leave an air inlet opening, and with its upper edge spaced below the top member to leave an air outlet opening, a heating element supported in the cabinet above and adjacent the air inlet opening, a grille positioned in said cabinet and extending from the lower edge of the air outlet opening inwardly across the ascending air path to the rear wall, said grille including air outlet openings and air deflector strips contiguous thereto extending longitudinally of said grille and projecting into the cabinet behind the grille and inclined in a direction toward the first mentioned air outlet opening, and an adjustable damper for said air outlet opening, swingably mounted above the air outlet opening and the adjacent portions of said grille and being swingable inwardly from a closed position to an open position, and said damper in any of its adjusted positions with respect to the grille adapted to aid in the direction of the air flow through the grille to the air outlet opening.

2. A convection heater comprising in combination, a cabinet having a front panel, end panels, a back wall and a top member, the front panel being of less height than the cabinet with its lower edge spaced from the bottom of the cabinet to leave an air inlet opening, and with its upper edge spaced below the top member to leave an air outlet opening, a heating element supported in the cabinet above and adjacent the air inlet opening, a grille positioned in said cabinet, said grille being curvilinear in cross section and extending inwardly and upwardly from the lower edge of the air outlet opening across the ascending air path to the rear wall, and a damper for said air outlet opening, swingably mounted above the air outlet opening and the portion of the grille adjacent the latter, and being swingable upwardly from a closed position to an open position and across the curvilinear face of the grille, and said damper in its closed position being parallel to the plane of the panel and acting as a closure for the outlet opening.

3. A convection heater comprising in combination, a cabinet having a front panel, end panels, a back wall and a top member, the front panel being of less height than the cabinet with its lower edge spaced from the bottom of the cabinet to leave an air inlet opening, and with its upper edge spaced below the top member to leave an air outlet opening, a heating element supported in the cabinet above and adjacent the air inlet opening, a grille positioned in said cabinet, said grille being curvilinear in cross section and extending inwardly and upwardly from the lower edge of the air outlet opening across the ascending air path to the rear wall, with said front panel suspended from the lower end of the grille, and a damper swingably mounted on an axis positioned above the air outlet opening, said damper being swingable inwardly from a closed position to an open position and across the curvilinear face of the grille, and said panel adapted to be detachably connected to the cabinet contiguous to the lower edge of the outlet opening.

4. A convection heater comprising in combination, a cabinet having a front panel, end panels, a back wall and a top member, the front panel being of less height than the cabinet with its lower edge spaced from the bottom of the cabinet to leave an air inlet opening, and with its upper edge spaced below the top member to leave an

air outlet opening, a heating element supported in the cabinet above and adjacent the air inlet opening, a fixed grille positioned in said cabinet and extending inwardly from the lower edge of the air outlet opening across the ascending air path to the rear wall, a damper for said air outlet opening, swingably mounted above the air outlet opening, said damper being swingable inwardly from a closed position concealing said grille to an open position exposing said grille, and friction means operatively supported from the top member for holding the damper in any position of adjustment, and a grille for the air inlet opening including louvres extending lengthwise of the cabinet and inclined upwardly and rearwardly to direct the incoming air through the heating element.

5. A convection heater comprising in combination, a cabinet having a front panel, end panels, a back wall and a top member, the front panel being of less height than the cabinet with its lower edge spaced from the bottom of the cabinet to leave an air inlet opening, and with its upper edge spaced below the top member to leave an air outlet opening, a heating element supported in the cabinet above and adjacent the air inlet opening, a grille positioned in said cabinet and extending from the lower edge of the air outlet opening inwardly across the ascending air path to the rear wall, a damper for said air outlet opening having one edge curled into an incomplete cylinder, swingably mounted above the air outlet opening on a flange formed as a part of the top member, said damper being swingable from a closed position to an open position, and U-shaped spring urged friction means supported from the top member and bearing against said incomplete cylinder and urging the same into frictional contact with said flange for holding the damper in any position of adjustment.

6. A convection heater adapted to be either free-standing in a room or mounted within a recess in a wall, comprising in combination, a cabinet having a front panel, end panels, a back wall and a top member, the front panel being of less height than the cabinet with its lower edge spaced from the bottom of the cabinet to leave an air inlet opening, and with its upper edge spaced below the top member to leave an air outlet opening, a heating element supported in the cabinet above and extending across the cabinet above the air inlet opening, a fixed grille mounted within the cabinet and incorporated as part of the front panel and extending inwardly and upwardly from the lower edge of the air outlet opening across the ascending air path to the rear wall, and a damper swingably mounted above the air outlet opening, said damper being swingable from a closed position to an open position to respectively conceal or expose said grille.

7. A convection heater comprising in combination, a cabinet having a detachable front panel, end panels, a back wall and a top member, the front panel being of less height than the cabinet with its lower edge spaced from the bottom of the cabinet to leave an air inlet opening, and with its upper edge spaced below the top member to leave an air outlet opening, a heating element supported in and extending across the cabinet above and adjacent the air inlet opening, an air directing grille positioned within the cabinet and secured at its lower edge to the front panel and extending inwardly from the lower edge of the air outlet opening across the ascending air path to the rear wall, said grille provided with air outlet openings and air deflector strips projecting into the cabinet behind the grille and inclined in a direction to direct air toward the first mentioned air outlet opening, and a damper swingably mounted above the air outlet opening and co-operable with the grille in the adjusted positions of the damper to direct the air toward the air outlet opening, said damper being swingable inwardly from a vertical closed position to an angular open position in the adjusted positions thereof.

8. In a convection heater adapted to be free-standing in a room or mounted within a recess in a wall, the combination of a cabinet having an air inlet opening at its bottom and an air outlet opening at the upper end of an upright wall thereof, a fixed grille extending inwardly across the interior of the cabinet from the lower edge of the air outlet opening, said grille provided with air outlet openings and air deflector strips projecting into the cabinet behind the grille and inclined in a direction to direct air toward the first mentioned air outlet opening, a damper movably mounted to cover and uncover the air outlet opening and to move across and respectively conceal or expose the grille and a second grille complementally formed to and removably secured in the air inlet opening.

9. A convection heater comprising, in combination, a cabinet including a front panel and forming an air inlet opening contiguous to the panel and adjacent the lower end of the cabinet, and an air outlet opening contiguous to the upper end of the panel and adjacent the upper end of the cabinet, a heating element supported in said cabinet adjacent and above the air inlet opening, a top forming the upper edge of the air outlet opening, a grille of curvilinear cross section positioned within the cabinet and below the top contiguous to the air outlet opening formed above the top edge of the panel and extending inwardly and upwardly across the ascending air path, said grille being attached to the cabinet, and a damper swingably mounted to cover and uncover the air outlet opening and to swing inwardly across and respectively conceal or expose the grille.

10. A convection heater comprising, in combination, a cabinet including a front panel and forming an air inlet opening contiguous to the panel and adjacent the lower end of the cabinet, and an air outlet opening contiguous to the upper end of the panel and adjacent the upper end of the cabinet, a heating element supported in said cabinet adjacent and above the air inlet opening, a top adapted to form the upper edge of the air outlet opening, a fixed grille of curvilinear cross section positioned in and attached to the cabinet and positioned below the top contiguous to the air outlet opening and extending inwardly across the ascending air path, said grille having air deflecting vanes extending longitudinally of the grille and inclined toward the air outlet opening, and a damper swingably mounted to cover and uncover the air outlet opening and to swing inwardly across and respectively conceal or expose the grille.

11. In a convection heater, the combination of a cabinet having an air inlet opening at its bottom and an air outlet opening at the upper end of an upright wall thereof, a fixed grille extending inwardly across the interior of the cabinet from the lower edge of the air outlet opening, said grille provided with air outlet openings and air deflector strips projecting into the cabinet

behind the grille and inclined in a direction to direct air toward the first-mentioned air outlet opening, a damper movably mounted to cover and uncover the air outlet opening and to move across and respectively conceal or expose the grille.

BENJAMIN SPIETH.

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