

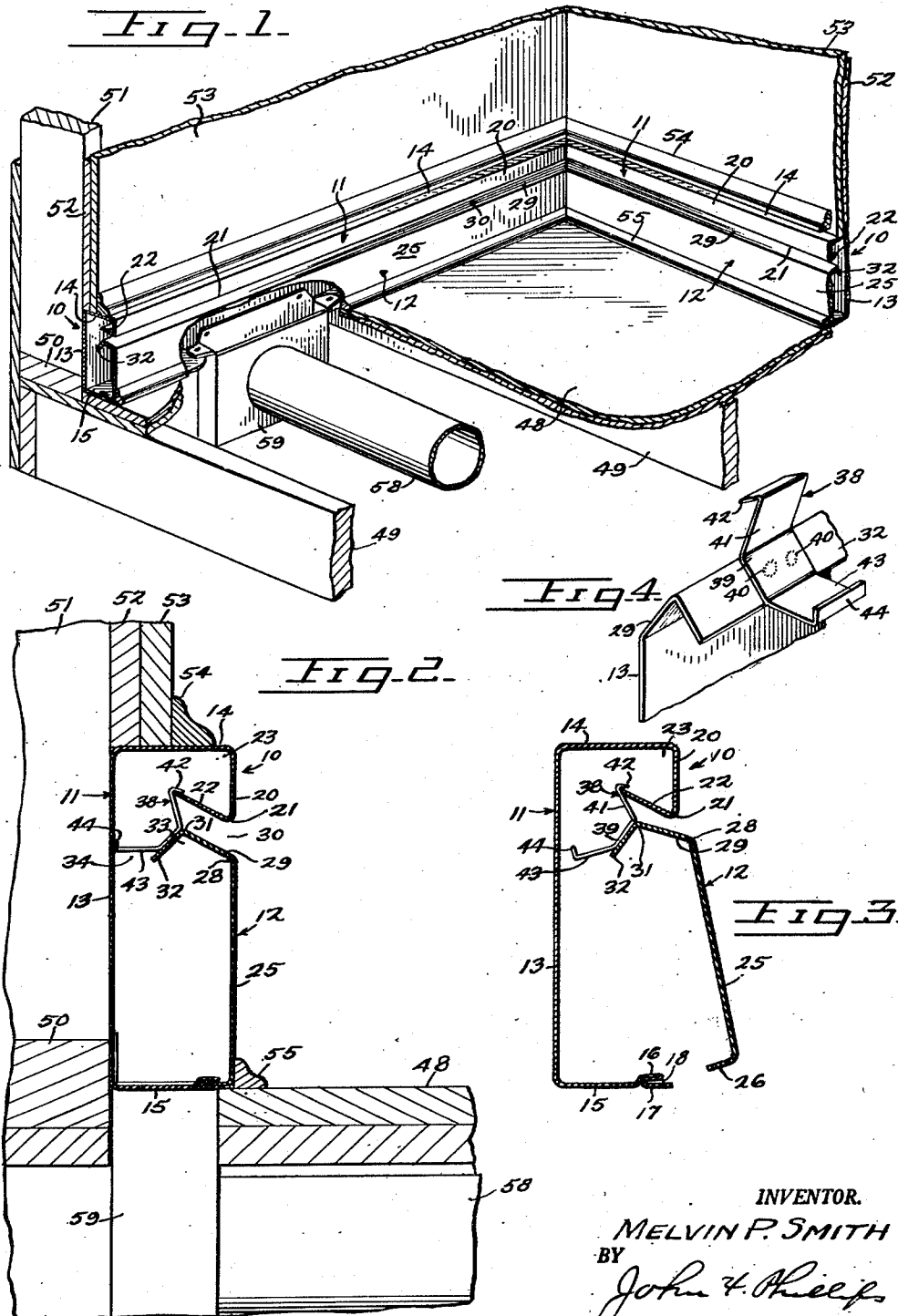
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WARM AIR HEATING DEVICE

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WARM AIR HEATING DEVICE

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This invention relates to a warm air heating device, and more particularly to a baseboard heating structure especially intended for homes.

A number of baseboard heaters are now commercially available and are in fairly common use for heating homes. These heating devices take the place of the usual baseboards and are in the form of relatively shallow ducts having outlets for the passage of warm air into the rooms of the house. Air is supplied from a suitable central heating system through inlet ducts.

Devices of this type vary in construction and all involve one or more disadvantages either from the standpoint of cost of production or inefficiency, and usually both. For example, such prior constructions permit the heated air from the central system to pass too rapidly through outlet ducts or openings with the result that most of the warm air flows into a room within a limited length of the baseboard heater adjacent each inlet duct. This requires the use of relatively closely arranged inlet ducts for an even distribution of warm air along the wall in which the device is installed. Moreover, because of the relatively free flow of warm air into a room, the heating of the room takes place almost solely by convection, and the air flows at a relatively rapid rate. This is disadvantageous for the further reason that when the supply of heated air to the baseboard heater is cut off by the thermostatically controlled means used for this purpose, the heating of the room is stopped substantially instantly. Accordingly, the air in the room stratifies quite rapidly, and this is obviously objectionable.

In prior constructions of the type referred to, efforts have been made to spread the heated air from an inlet duct longitudinally through the duct to more uniformly distribute the hot air into the room. This has been accomplished in many cases by the use of expensive spreaders, baffles, etc. In other cases, the baseboard heater is provided with spaced discharge orifices to slow down the discharge of heated air at each given point along the baseboard heater.

An important object of the present invention is to provide a highly simplified type of baseboard heater, particularly for hot air heaters, wherein a uniform distribution of heat longitudinally of the baseboard heater is effected without the use of the commonly employed types of spreaders, baffles, etc.

A further object is to provide a baseboard heater of the type referred to wherein wall portions of the device itself are relied upon to provide a highly efficient distribution of the heat longitudinally of the heater so as to provide a uniform flow of warm air into the room without the use of spreaders, baffles, etc., and without the use of a substantial number of inlet ducts for the air.

A further object is to provide such a construction wherein integral wall portions of the baseboard heater are utilized not only for spreading the heated air very efficiently throughout the length of a relatively long heater so as to provide uniform distribution of heat, but wherein the structure serves to slow down the discharge

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of heated air at all points therealong, thus eliminating the usual disagreeable rapid flow of heated air and also serving to maintain the baseboard heater itself relatively highly heated so that the structure heats a room not only by convection but also by radiation.

A further object is to provide such a construction wherein a relatively large percentage of heat units is utilized for heating a room by radiation in the manner stated, thus eliminating the sudden shutting off of heat when the flow of heated air to the construction is cut off, thus tending to maintain a room more uniformly heated and materially reducing objectionable stratification.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawing I have shown one embodiment of the invention. In this showing:

Figure 1 is a fragmentary perspective view showing the installation of the device in a room of a building,

Figure 2 is a fragmentary vertical sectional view through the device and associated elements,

Figure 3 is a detail vertical sectional view through the baseboard heater showing the parts partially assembled, and

Figure 4 is a fragmentary detail perspective view showing one of the bracing clips in position on a portion of one wall of the device.

Referring particularly to Figures 2 and 3, the numeral 10 designates the baseboard heater as a whole preferably formed of two body sections respectively indicated as a whole by the numerals 11 and 12. The body section 11 is preferably formed of an integral sheet of metal and comprises a preferably flat vertical rear wall 13, a horizontal top wall 14 and a horizontal bottom wall 15. The bottom wall 15 is doubled back upon itself as at 16, vertically offset upwardly from the body of the wall 15, and the extremity of the material of the bottom wall, indicated by the numeral 17, extends away from the back wall 13 preferably in the plane of the body of the bottom wall 15 and forming with the bent portion 16 a space 18 for a purpose to be described.

The body member 11 further comprises an upper forward wall 20 preferably parallel to and spaced from the back wall 13. At the lower edge of the forward wall 20, the metal of the body member 11 is bent as at 21 and then extends upwardly and rearwardly to form a wall portion 22, the inner extremity of which is spaced roughly equidistantly between the back wall 13 and front wall 20. Such inner extremity of the wall portion 22 is also spaced substantially below the top wall 14 and forms with such wall and the forward wall 20 a pocket 23 further referred to below.

The body member 12 comprises a preferably vertical front wall 25 parallel to the wall 13 and preferably in the vertical plane of the forward wall 20 of the body member 11. The lower extremity of the wall 25 is turned rearwardly to form a longitudinal flange 26 which is received in the space 18, the members 16, 17 and 26 thus forming what is commonly known as a "Pittsburgh" joint. It will become apparent that the flange 26 will be snugly received in the space 18.

At the upper end of the wall 25, the body member 12 is bent at an angle as at 28 and then extends upwardly and rearwardly to form a wall portion 29, preferably spaced from and parallel to the wall portion 22 to form therewith a substantially unbroken longitudinal hot air discharge opening 30. The material of the body 12 is bent at the upper rear extremity of the wall portion 29 as at 31 and then extends downwardly and rearwardly as at 32 to form a longitudinal integral baffle extending throughout the length of each section of the heating device. The angle between the wall portions 29 and 32

forms a longitudinally extending pocket 33, for a purpose to be described. The rear extremity of the baffle wall 32 is spaced from the rear wall 13 a distance substantially less than the spacing from such wall from the rear extremity of the wall portion 22 to form a longitudinally extending, relatively restricted hot air passage 34.

Referring to Figure 1, it will be apparent that the opening 30 for the discharge of heated air extends throughout the length of each section of the baseboard heater. The two body members 11 and 12 are directly connected to each other solely by the "Pittsburgh" joint referred to and the upper extremity of the body member 12 is wholly free of the portions 20, 21 and 22 of the body section 11. The bends 23 and 31 provide the body member 11 with substantial beam strength to withstand any pressures against the forward wall 25. However, it is desired further to increase the stability of the upper portion of the body member 12 to prevent its inward displacement, and for this purpose, the construction is provided at any desired spaced intervals with clips 38, one of which is shown in perspective in Figure 4. Each of these clips comprises an intermediate portion 39 preferably spot welded as at 40 to the wall portion 32 of the body section 12. Above the intermediate portion 39, each clip extends upwardly and rearwardly at somewhat of an angle toward the back wall 13 as at 41, and terminates at its upper end in a flange 42 preferably extending slightly downwardly and forwardly toward the wall 20 to be hooked over the rear edge of the wall portion 22. Below the intermediate portion 39, each clip has a rearwardly and substantially horizontally extending portion 43 terminating in an upstanding flange 44 adapted to seat against the rear wall 13 as shown in Figure 2.

In the manufacture of the construction, clips 38 are preferably spot welded to the baffle wall 32 at intervals of from 16 to 18 inches apart. The construction is furnished with additional loose clips which may be utilized in a manner to be referred to.

A typical installation of the heater is shown in Figures 1 and 2, the illustration being in conjunction with a new house in which an original installation is made. The bottom of the heating duct rests upon the floor 48 secured in position with respect to the usual joists 49. The back wall 13 is shown in such installation as being backed up to one of the plates 50 and the adjacent edges of the studding 51. The usual lathing 52 and plaster 53 terminate above the wall 14 and against the plaster 53 is secured, if desired, the usual cap molding 54. The usual foot molding 55 may be arranged against the bottom portion of the front wall 25 and positively retains the "Pittsburgh" joint assembled.

It will become apparent that the specific means for supplying heated air to the present device may be of any desired type. Moreover, the device is applicable to hot water or steam heating by the use of pipes within the structure, but the latter is particularly intended for use in warm air heating systems. To this end, a duct 58 leading from a central heating system may have an end turned up into communication with the interior of the device or a junction box 59 may be tapped through the bottom wall of the device as shown in Figure 1.

Operation

The devices are furnished to builders in any desired standard lengths as will be apparent. Where two sections are to be connected end to end, short sections of body members similar in cross-section to the assembled device may be employed as sleeve members for connecting one section to another. A dead end of the duct may be capped by an ordinary cap structure comprising top, bottom, front and rear walls and an end wall to slip over the dead end of the device. Such connecting members and capping members form no part of the present invention and their use will be obvious.

In installing the construction in the new house, the

body member 11 will be arranged in position with its back wall 13 against the studding and it will be directly nailed or otherwise attached to the studding. The body member 12 is then assembled in the manner suggested in Figure 3. The upper ends of the clips 38 are inserted through the open front of the body member 11 and the upper flanges 42 are hooked over the rear edge of the wall portion 22, the parts then being assembled as shown in Figure 3. It then is merely necessary to swing the bottom of the body member 12 downwardly and inwardly, the clip flanges 42 positioning the flange 26 to slide over the flange 17 for movement into the space 18, the flange 26 being forced rearwardly to the limit provided by the space 18, whereupon, the parts assume the positions shown in Figure 2. It will be noted in this connection that the flange 44 of each clip forms a foot engaging the rear wall 13 with the portion 43 of each clip serving as an effective brace for the baffle wall 32. Thus the parts of the device may be quickly and easily assembled to form a rigid unit. The particular connection of the inlet duct is of no importance and need not be specifically described.

After installation of the device, lathing and plastering and the placing of moldings in position may take place. When the device is installed in older residences, the baseboard and its moldings will be removed and the back wall 13 will be placed in position against the plaster and fixed in position in the same manner as described above.

Heated air is supplied to the interior of the device at or adjacent the bottom thereof and preferably through the bottom wall of the device as shown in Figures 1 and 2. The upwardly flowing air forwardly of the rear edge of the baffle wall 32 will impinge against the wall portion 29 and will flow upwardly and rearwardly therealong and thence downwardly and rearwardly along the baffle wall 32. This not only causes eddy currents in the pocket 33, which extends longitudinally throughout the construction, but results in downwardly moving air adjacent the opening 34, which extends longitudinally throughout the device, and interferes with and retards the upward flow of heated air through the opening 34. The air flowing through such opening will move upwardly against the top wall 14, forwardly along this wall, that is, toward the wall 20, thence downwardly along the wall 20 and upwardly and rearwardly along the wall 22. Eddy currents will be caused in the pocket 23 which tends further to interfere with the upward flow of air into the top of the device.

It will be noted that the width of the opening 34 is less than the space between the rear wall 13 and the rear edge of the wall portion 22. With such arrangement, the opening 34 provides for the restricted upward flow of warm air out of the bottom of the heater, the width of the upwardly flowing stream of air being defined by the width of the opening 34. Such air flows upwardly into the rear of the pocket 23, thence forwardly beneath the top 14 and downwardly adjacent the wall 20 to be intercepted by the flange 22 and caused to flow upwardly and rearwardly. The arrangement of parts is such that some circling or eddying of the air will occur in the forward portion of the pocket 23 which tends further to restrict the rate of flow upwardly through the opening 34 to secure an even better distribution of air in the top portion of the device longitudinally thereof. The air will spill over the rear edge of the flange 22 to flow downwardly and thence out through the discharge opening 30. The air flowing downwardly over the edge of the flange 32 is in the form of a stream having the rear portion thereof encountering the stream of air flowing upwardly from the opening 34 to tend further to retard the flow of such air. The features of the construction, therefore, are such that the flow of air from the opening 30 adjacent one of the inlets 59 is almost exactly the same as air flowing from the opening 30 many feet away from the inlet duct. Accordingly, throughout the length of each wall of a room

equipped with one of the devices there will be an even flow of air to the room to provide for the even heating of the room.

Thus it will be apparent that the inherent characteristics of the construction, without the use of separate, expensive baffles, deflectors, etc., tend effectively to retard the upward flow of air through the device. As a result, the force of the incoming air from the inlet duct causes the heated air in the device to very readily spread longitudinally thereof wholly without any interference. In other words, there is nothing in the device tending to prevent horizontal flow, except for the negligible resistance of the small flat clips 38, and accordingly the air tends to follow the course of least resistance and spreads relatively evenly throughout the length of an entire wall against which one of the heaters is arranged. It is for this reason that there will be a remarkably uniform flow of air from all portions of each opening 30, even at great distances from the inlet duct. In actual practice, it has been found that as far as 14 feet from an inlet duct the rate of flow of air from the opening 30 is substantially identical with the corresponding flow in the vertical plane of an inlet duct and, in fact, through all intervening vertical planes.

As a result, the present construction involves several substantial advantages. The opening 30 can face downwardly at an angle since the flow of air therefrom is so slow that occupants of a room are not conscious of any flow of air and a disagreeable "blast" of hot air is thus prevented. As a matter of fact, the flow is so steady, slow and uniform that from 12 to 14 inches from the baseboard there is no feeling of any direct flow of air. The downward flow of air is advantageous for the reason that warm air tends to rise and the present construction operates in practice to heat by steady convection the portion of a room which normally is coolest, namely, toward the floor, while at the same time eliminating any perceptible feeling of a flow of hot air.

This is permitted not only because of the slowing down of the rate of air discharge, but also because of the uniform distribution of air throughout the length of each heating section.

Another substantial advantage results from the use of the present construction. As previously stated, structures of this character heat a room almost solely by convection and the heating action stops abruptly when the flow of air through an inlet duct is cut off. With the present construction, the maintenance of the hot air within the device and its uniform spreading throughout the length thereof maintains relatively highly heated air in the device and relatively highly heats the body members 11 and 12. As a result, a very substantial percentage of heat units in the room will result from radiation from the wall portions 14, 20 and 25. This in itself is advantageous for two reasons. In the first place, the substantial rate of radiation tends to dissipate the heat resulting from convection, and accordingly, it has been found that for fairly large rooms, air temperatures will vary not more than one or two degrees from maximum to minimum in any part of the room from the ceiling substantially to the floor of the room. Moreover, substantial heat is stored in the device by the maintenance of the air at relatively high temperatures. Therefore, when the flow of heated air is cut off, the radiation of heat will continue for a substantial length of time and will minimize the very objectionable stratification of the air.

It will be apparent that the use of the clips 38 is advisable to minimize any possible bending and damaging of the parts, and these clips are very cheap to make and easy to install. Except for the clips, the entire construction consists of only two sheet metal body members which are easily formed to finished cross-sectional shape on conventional bending or rolling machines. There are no additional pieces to make or install, such as separate baffles, deflectors, etc. The controlling of the longitudinal

distribution of the heat, the uniform discharging of heated air, and the maintenance of relatively high heat in the duct for radiation purposes are all advantageous results economically provided by the simple bending of the parts as described.

For the purpose of utilizing with maximum efficiency the radiation of heat from the device, it is recommended that aluminum foil be attached to the front or back face of the back wall 13. The use of such heat reflecting means is not essential and forms no part of the present invention, but it serves obviously to some extent to improve the already high degree of efficiency inherent in the present construction.

As previously stated, the clips 38 are preferably spot welded to the baffle wall 32 at the factory and are arranged at any desired suitable intervals which may be as close as 16 inches on centers if desired, although they may be spaced a greater distance apart. Their use is not essential, but they provide a novel and effective bracing means and they assist in the assembly of the device as described above and as will be apparent from Figure 3. Also as stated, a number of loose clips are included in each shipment of the parts of the structure. The sheet metal sections readily may be cut to suitable length with a hack saw, and assuming that one end of a duct terminates a substantial distance from one of the spot welded clips 36, one of the loose clips may be employed adjacent the cut end of the duct. Under such conditions, the intermediate section 39 of one of the loose clips and the desired point intermediate the edges of the baffle wall 32 may be punched and a metal screw inserted through the parts to secure them in position. Thus one of the clips easily may be applied adjacent an end of a duct section.

It is to be understood that the form of the invention shown and described is for the purpose of illustration and that the invention is defined in the appended claims.

I claim:

1. A baseboard heater comprising a pair of elongated sheet metal body sections, one section comprising a rear wall, a top wall and a bottom wall, and an upper front wall section of substantial vertical width, said upper front wall section at the lower end thereof being bent inwardly to form an outlet wall portion spaced from said top wall to form a pocket, the other section of said casing comprising a lower front wall section having at the top thereof a wall extending into the casing to form a second outlet wall portion spaced from said first-mentioned outlet wall portion and forming therewith an air outlet duct extending longitudinally of said casing, said outlet wall portions extending upwardly and inwardly at an angle to the horizontal, and means for supplying heated air to said casing adjacent the bottom thereof.

2. A baseboard heater according to claim 1 wherein the metal of the second-named outlet wall is turned downwardly at its inner end to form a longitudinal baffle wall having its rear edge spaced from said rear wall and cooperating therewith to form a relatively restricted longitudinal passage for the upward flow of air therethrough, the rear edge of said second-named outlet wall being spaced a greater distance from said rear wall than the rear edge of said first-named outlet wall.

3. A baseboard heater according to claim 1 wherein the lower end of said lower front wall section is turned inwardly to form a longitudinally extending edge portion, the front edge of said bottom wall and the adjacent extremity of said longitudinal edge portion cooperating to form a Pittsburgh joint, said outlet wall portions extending upwardly toward said rear wall at an angle to the horizontal and terminating in spaced relation to said rear wall, the metal of the inner extremity of said second outlet wall portion extending downwardly and rearwardly toward said rear wall to form a longitudinal baffle wall spaced from said rear wall, and a clip fixed to said baffle wall and

having an end extending rearwardly into engagement with said rear wall.

4. A baseboard heater according to claim 1 wherein the lower end of said lower front wall section is turned inwardly to form a longitudinally extending edge portion, the front edge of said bottom wall and the adjacent extremity of said longitudinal edge portion cooperating to form a Pittsburgh joint, said outlet wall portions extending upwardly toward said rear wall at an angle to the horizontal and terminating in spaced relation to said rear wall, the metal of the inner extremity of said second outlet wall portion extending downwardly and rearwardly toward said rear wall to form a longitudinal baffle wall spaced from said rear wall, and a clip fixed intermediate its ends to said baffle wall and having a lower end portion extending rearwardly into engagement with said rear wall, said clip having an upper end portion extending upwardly and terminating at its upper extremity in a hook engaging over the inner edge of the first-named outlet wall portion.

5. A baseboard heater comprising an elongated sheet metal casing having top and bottom walls and a rear wall, and having horizontally elongated upper and lower front wall sections of substantial vertical width terminating in parallel spaced relation to each other, the metal of said front wall sections substantially throughout the length thereof being turned inwardly and upwardly into said casing at an angle to the horizontal in substantially parallel relation to define upper and lower flanges forming therebetween a discharge opening extending longitudinally of said casing, said upper flange being spaced below said top wall to form a pocket.

6. A baseboard heater according to claim 5 provided with a bracing clip bearing against said rear wall and carried by said lower flange.

7. A baseboard heater according to claim 5 wherein said lower flange has an inner longitudinal edge portion extending downwardly and rearwardly toward said rear wall and forming a baffle wall.

8. A baseboard heater comprising an elongated sheet

metal casing having top and bottom walls and a rear wall, and having horizontally elongated upper and lower front wall sections of substantial vertical width terminating in parallel spaced relation to each other, the metal of said front wall sections substantially throughout the length thereof being turned inwardly into said casing in substantially parallel relation to form a discharge opening extending longitudinally of said casing, the inwardly extending portion of said lower front wall section having a longitudinal edge portion extending downwardly and rearwardly toward said rear wall to form a longitudinally extending baffle spaced from said rear wall to define therewith a relatively restricted longitudinally extending passage for the upward flow of heated air, and a bracing clip fixed to said baffle and extending rearwardly into engagement with said rear wall.

9. A baseboard heater according to claim 8 wherein said inwardly turned portions of said front wall sections extend upwardly and inwardly at an angle to the horizontal whereby warm air discharged from said opening will flow downwardly at an angle from said casing, said clip having an upwardly extending end provided at its upper extremity with a hook engaging over the inner end of the inwardly extending portion of said upper front wall section.

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