

May 28, 1963

R. WEINSTEIN

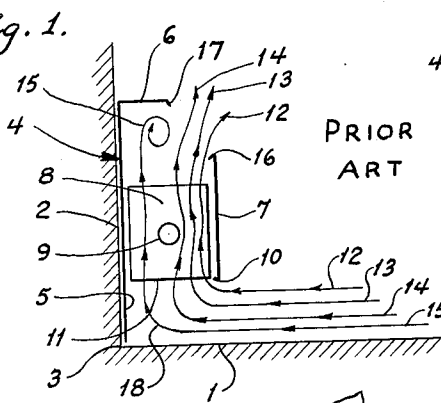
3,091,289

BASEBOARD RADIATORS AND ELEMENTS THEREOF

Filed Sept. 30, 1959

2 Sheets-Sheet 1

Fig. 1.



PRIOR
ART

Fig. 2.

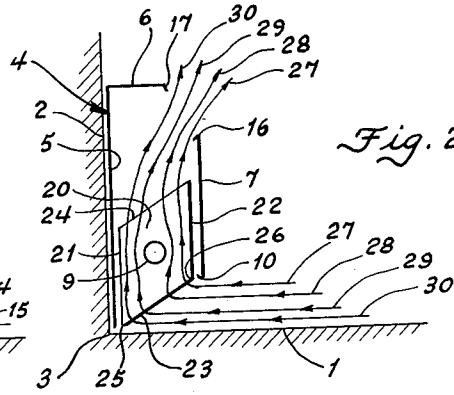


Fig. 5.

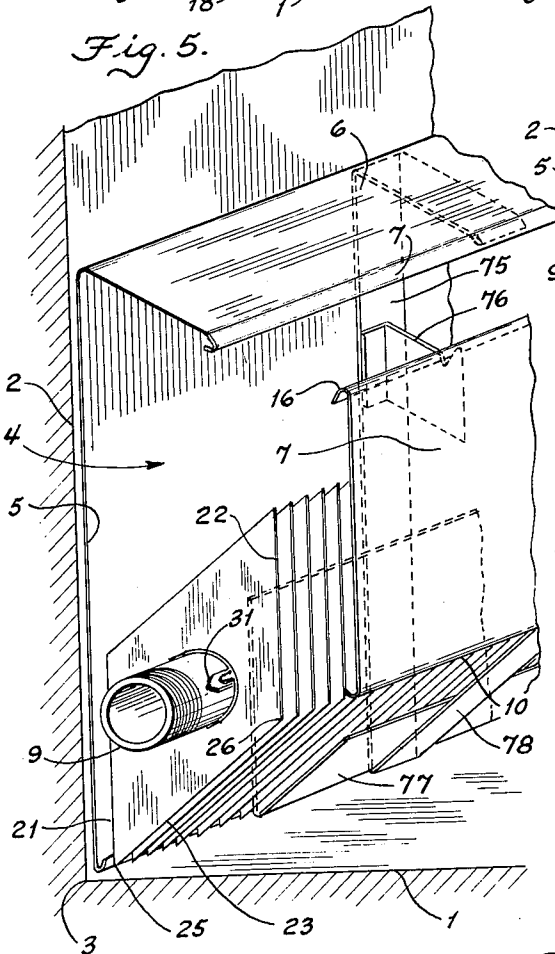


Fig. 3.

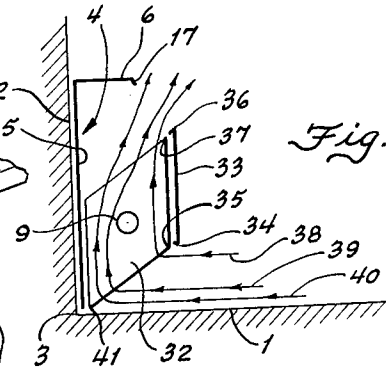
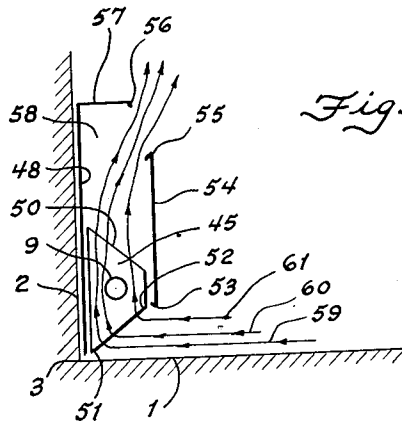


Fig. 4.



INVENTOR.

RICHARD WEINSTEIN

BY

Albert M. Parker

ATTORNEY.

May 28, 1963

R. WEINSTEIN

3,091,289

BASEBOARD RADIATORS AND ELEMENTS THEREOF

Filed Sept. 30, 1959

2 Sheets-Sheet 2

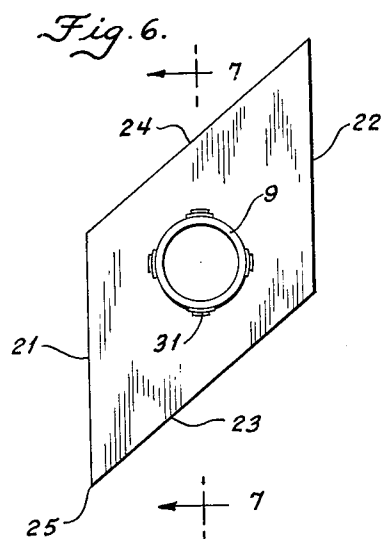
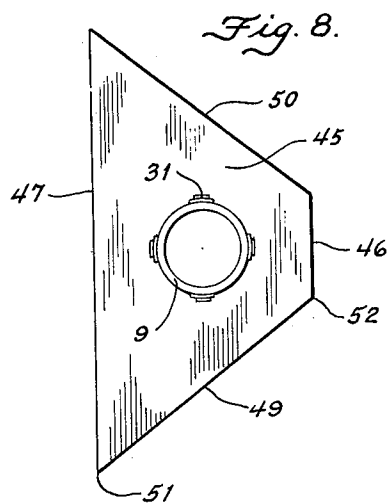


Fig. 7.

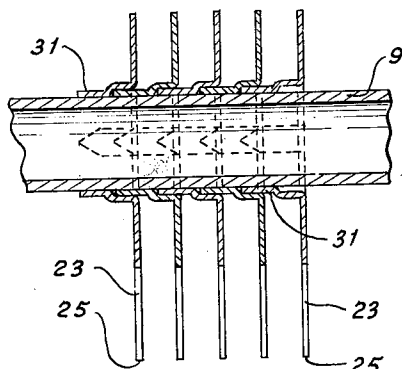


Fig. 9.

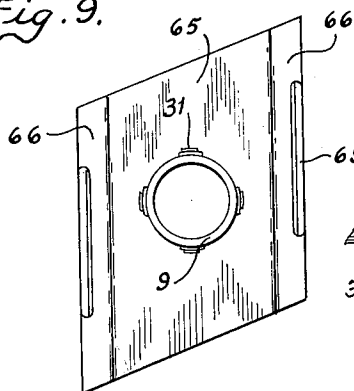


Fig. 10.

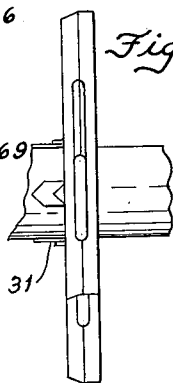


Fig. 12.

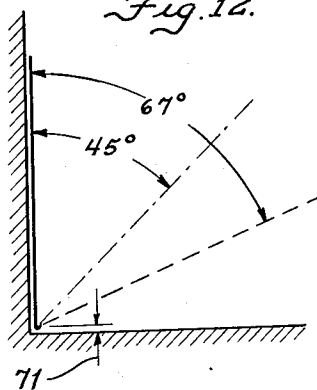
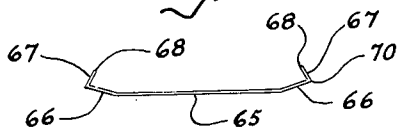


Fig. 11.



INVENTOR.

RICHARD WEINSTEIN

BY

Albert M. Parker

ATTORNEY.

1

2

3,091,289 BASEBOARD RADIATORS AND ELEMENTS THEREOF

Richard Weinstein, Brooklyn, N.Y., assignor to Slant/Fin Radiator Corporation, Richmond Hill, N.Y., a corporation of New York

Filed Sept. 30, 1959, Ser. No. 843,571
2 Claims. (Cl. 165—55)

This invention relates to radiators and is particularly concerned with those known as "baseboard radiators," inasmuch as they take the place of normal baseboards.

In the heating of areas by the use of baseboard radiators one of the problems to be overcome is to reconcile the apparently inconsistent factors of making the radiators as small and inexpensive as possible while still enabling them to provide adequate heating for the space. Economy of construction must not, however, adversely affect economy of operation. Thus, if the heating effect achieved by baseboard radiators can be increased by even a small percentage without increasing the space occupied, or even by diminishing that space, and without increasing the cost of construction, all while maintaining economy of operation, it is an important advance in the industry.

Heretofore, however, insufficient consideration has been given to the heat efficiency of baseboard radiation. Installations have also been too cumbersome, space consuming and expensive. These things are believed to have been largely due to a lack of appreciation of the factors involved in effective heating from the baseboard position and how to put those factors into use. The instant invention, however, has taken all of the factors into consideration and the resultant construction takes advantage of all the possibilities without, however, increasing the cost or complexity of the construction.

It is, accordingly, an object of the invention to improve the efficiency of baseboard radiators.

Another object is to improve that efficiency without increasing the cost of construction or installation.

Still another object is to increase the effectiveness of baseboard radiation by the proper utilization of existing possibilities.

Further and more detailed objects will in part be obvious and in part be pointed out as the description of the invention taken in conjunction with the accompanying drawing proceeds.

In that drawing:

FIG. 1 is a diagrammatic transverse sectional view of one of the most effective forms of baseboard radiators heretofore employed showing by way of vectors the heating of air thereby.

FIG. 2 is a similar view showing baseboard radiation in accordance with the invention.

FIG. 3 is a view similar to FIG. 2 showing a slight modification thereof.

FIG. 4 is a similar view showing a further modification.

FIG. 5 is an enlarged fragmentary perspective view showing the actual construction of the baseboard radiator in accordance with FIG. 2.

FIG. 6 is an enlarged elevational view of one of the fins of the FIG. 2 form.

FIG. 7 is a vertical section thereof taken on lines 7—7 of FIG. 6 and looking in the direction of the arrows.

FIG. 8 is an enlarged elevation of an individual fin as shown in FIG. 4.

FIG. 9 is an elevational view of a modified form of fin.

FIG. 10 is an end elevation thereof.

FIG. 11 is a top plan view thereof; and

FIG. 12 is a diagrammatic view illustrating the range of angles of the lower edge of the fins for improved heat efficiency.

In the accompanying drawing wherein the invention is illustrated by way of a preferred form and modifications thereof, and where the same reference characters are used for like parts throughout, the floor of a space to be heated is generally indicated at 1, with the wall rising up therefrom being indicated at 2. These meet at the corner 3. The back and top panel member of a radiator, generally indicated at 4, has a back portion 5 and a top portion 6. This member is secured to the wall, acts as insulation to prevent heat being wasted through the wall and also serves for the mounting of the fin and pipe construction as well as for the front cover plate 7. Certain of these details have been shown in FIG. 5 but have not been otherwise stressed inasmuch as they might take a variety of forms without varying the spirit and scope of the invention.

In the prior art showing of FIG. 1, rectangular fins 8 are shown as mounted on the steam pipe 9. It is, of course, to be understood that a multitude of these fins in spaced relation will be mounted along the steam pipe 9 so that the air to be heated entering in the opening between the lower end 10 of the cover plate 7 and the surface of the floor 1 will pass up therebetween. It has heretofore been considered proper practice, however, to make the fins 8 of rectangular form and to position the lower edge 11 substantially in alignment with the bottom edge 10 of the cover plate 7. With this arrangement the vectors 12, 13, 14 and 15 illustrate the paths followed by the streams of air which enter the opening between the bottom edge 10 and the floor 1 flow through the radiator and out the outlet between the top edge 16 of the cover plate and the forward edge 17 of the top panel part 6.

As seen in FIG. 1 the air streams represented by the vectors 12, 13 and 14 make relatively short turns before entering the radiator, pass up through the same and with their natural tendency to seek the nearest outlet, flow out through the opening between the edges 16 and 17. The air stream represented by the vector 15, however, must follow a considerably longer path and, being along the floor, it is the coolest path. Also, this stream turns upward closest to the corner 3, as well as turning on a longer radius, as seen at 18, it meets resistance along the way. This stream is not adequately heated and, as it emerges from the top surface of the fin, it has neither the velocity nor the heat capacity to enable it to break its way into the exit path occupied by the air stream represented by the vectors 12, 13 and 14. Thus the air stream represented by the vector 15 is backed upon itself, illustrated by the curling around at its end, as best seen in FIG. 1.

Looking at it another way, the necessity for the air streams flowing in the manner they do in the FIG. 1 showing results in inefficient use of the fins 8. This is because the rear part of the fins past which the air stream, represented by the vector 15, flows is not effectively used and is not able to heat the air in the stream 15 as it should do for efficient operation.

It would be no solution to the problem to remove the top panel piece 6 for the air in the stream 15 would still be inadequately heated. More importantly, it has become recognized in the industry that it is essential for air to leave baseboard radiators through frontal apertures, such as between the edges 16 and 17 in FIG. 1. The air flow cannot be permitted to go straight up the wall, for, at the least the wall would shortly become discolored and could readily be scorched.

In accordance with the invention as seen in FIG. 2, the same shape, size and arrangement of enclosure for the

3

heating elements is employed as seen in the prior art showing of FIG. 1. The drawbacks of the FIG. 1 arrangement are eliminated however and the heat efficiency is materially increased. In the FIG. 2 construction the fins 20 carried by the steam pipe 9 are in the form of parallelograms, or may be considered as being of diamond shape. The sides, or edges, 21 and 22 remain vertical but their bottom edge 23 and top edge 24 are inclined upwardly at an angle with respect to the floor 1 from the corner 3 between the floor and the wall 2.

One important feature to note is that the lower rear corner 25 of the fins 20 lie down very close to the surface of the floor 1. For best results this corner should be as close to the floor as possible. The instructions for commercial installations in accordance with the invention allow only $\frac{1}{4}$ " tolerance at this position, i.e. $\frac{1}{4}$ " between the floor level and the lower corner of the fin, as at 25. Obviously the inner edge 21 of the fin is close to the back panel portion 5 so that practically all the air is caused to pass through the radiator.

It is also important to note that the front corner 26 of the bottom edge of the fin 20 lies in the same horizontal plane as the lower edge 10 of the cover 7. This is important for the best flow of air and instructions for commercial operation allow only a tolerance of plus, or minus $\frac{1}{4}$ " difference in the horizontal position of these parts.

Another important thing to note is that the heating pipe 9 in the FIG. 2 form is at a materially lower level than that of the prior art, as shown in FIG. 1. This increases the stack height obtainable in baseboard radiation to considerable extent as against that of the prior art. The air is kept in contact with the heating source longer, which causes better flow conditions, causing the air to be pulled in better and would effectively make the height greater.

In considering the streams of air flowing through this radiator as contrasted with those flowing through the radiator in FIG. 1, reference is made to the vectors 27, 28, 29 and 30. Here, due to the fact that the lower edge 23 of the fin slopes downwardly towards the corner 3 at a decided angle, the turn to be taken by the stream, illustrated by the vector 30, is on a small radius as it flows in between the fins of the radiator and it meets the radiator as soon as it reaches its rearmost position. Thus the resistance to its flow is minimized and the air stream does not remain in the coolest zone before reaching the radiator to anything like the extent that is done by the stream illustrated by the vector 15 in FIG. 1. The air in the stream 30 is adequately heated and as it emerges from the spaces between the fins at their top edges 24 it follows the natural tendency to flow towards an opening. Thus it bends toward the opening between the ends 16 and 17 and has the volume, heat content and velocity to enable it to take its place along with the streams illustrated by the vectors 27, 28 and 29. Thus all the air heated by this radiator flows out through the opening towards the space to be heated and the heating efficiency is thereby materially increased. However, no greater amount of metal is used, the overall structure is just as simple and no greater space is occupied.

Applicant has proven by actual tests that the flow of heated air in constructions as in FIGS. 1 and 2, is as generally illustrated by the vectors in those figures. What is more important, applicant has determined from tests that with the same fin area, but with the fins formed and positioned as in the FIG. 2 form as against that of the FIG. 1 form throughout a wide range of different conditions for the creation of convection currents, the output in terms of B.t.u. per linear foot per hour of the radiator assembly in accordance with the invention is increased on an average of 10% over that of the FIG. 1 form.

Another aspect of the invention to consider is the

4

result of variations in the angle of the bottom surface 23 with respect to the vertical. Substantial improvement in B.t.u. per linear foot of pipe per hour is produced when the angle of the end edge 23 to the vertical of the wall 2 ranges all the way from 45° to 80°. Best results, however, as illustrated from the FIG. 12 form, are achieved when the angle is in the range between 45° and 67°.

It is also noticeable that, in contrast to some prior practices, effective heat transfer is here achieved by the use of a single steam pipe 9, which also serves, of course, for the mounting of the fins thereon. This mounting and spacing of the fins is illustrated in the form of FIG. 7 where the interlocking of the fins together by the tooth and bubble arrangement of their portions flanged along the pipe is illustrated at 31.

A somewhat modified form of the invention is illustrated in FIG. 3. Here the fins 32 are again of diamond form but are somewhat wider than the fins 20, thereby providing somewhat greater surface contact for the heating of the air as it flows through between the fins. In this instance the front cover 33 is accordingly spaced further from the back cover 5, but, at the same time, is reduced in height. Its bottom edge 34 is again on substantially the same level as the front corner 35 of the fin 32. Its upper edge 36, however, is at substantially the same level as that of the upper front corner 37 of the fin 32. This provides a wider opening between the edges 36 and 17 and allows the air stream illustrated by the vector 38 to turn immediately out through the opening, leaving more room for the air streams represented by the vectors 39 and 40 to flow out. The relationship between the lower inner corner 41 of the fin 32 and the floor 1 remains the same as that in FIG. 2.

The form of FIG. 3 can be employed when a lower wider installation is needed and when it is desired to give off more heat at a lower level.

Where conditions indicate the desirability of a construction involving what is called "high covers" the form as shown in FIG. 4 has been found to be most effective. Here a high narrow radiator is provided and for best heating results the fins 45 are formed as trapezoids having their short edges 46 positioned outwardly from the wall with their longer edges 47, parallel thereto, positioned closely adjacent the vertical portion 48 of the back cover. The lower edges 49 slope upwardly at an angle from and with respect to the wall corner 3, while the upper edge 50 slopes downwardly and outwardly from the back wall at a somewhat similar angle.

The lowermost corner 51 of this type of fin is again positioned close to the floor the same as the corner 25 of the FIG. 2 form. Also, the front corner 52 lies in the same horizontal plane as the bottom edge 53 of the front cover 54. The front cover 54, however, extends up a substantial distance beyond the uppermost extremity of the fins 45 to its upper edge 55. This edge 55 which with the opposed edge 56 of the top part 57 of the back cover borders the opening for the air to flow out. It will thus be apparent that the streams of air emerging from between the upper edges 50 of these fins 45 have considerable distance to travel through the upper space 58 of the enclosure before they emerge into the space to be heated. In certain installations it is necessary that the radiators be of this form, but the favorable heating characteristics of the invention are maintained by the use of the fins in trapezoid form. Though the air current illustrated by the vector 59 has to travel a greater distance than those illustrated by the vectors 60 and 61, each in relation to its travel is heated for a longer period of time so that as the streams emerge from the surface 50 they all have adequate velocity to flow together out through the opening between the edges 55 and 56.

A modified form of fin, particularly useful in a small

5

light weight construction, and for providing adequate structural strength, is illustrated in FIGS. 9-11. This, is identified as being of the closed diamond form. It has a main portion 65 lying in substantially a single plane. Then vertical sides have portions 66 which extend first backwardly at a small angle with respect to the portion 65. Each of these portions 66 terminate in portions 67 extending back at right angles with respect to the portions 66. Thus, as will be apparent from the showing of FIGS. 10 and 11, the free edge faces 68 of the portions 67 will, when the fins are brought together on a pipe, lie against the opposed surface of the portion 66 of the adjacent fins.

Another feature to note here is that the intermediate portions of the parts 66 and 67 throughout part of the height thereof are formed with slots 69 therethrough. These slots are formed through the corner portions 70 and extend part way into each of the portions 66 and 67. When fins so formed are assembled together on a pipe, a strong, silent effective structure is provided while the flow of air therethrough is enhanced by the provision of the slots 69.

In FIG. 12 there is a showing of the angles previously referred to for the bottom edges of the fins with respect to the vertical to produce highly effective results. In this figure also, the space between the arrows 71 is indicative of the closeness of the bottom edge of the fin to the floor adjacent to the back cover.

In FIG. 5 one simple manner of securing the elements of the assembly together is shown. Here the strap 75 is snapped in place into the back cover 4. It carries the bracket 76 which supports the front cover 17 by means of the turned over portion 16 thereof engaging the projection of the bracket. The bracket 75 also continues upwardly from beneath the fins to engage with the lower edge in the portion 78 of the front cover 7 having a portion to seat within its intumed edge 10. The strap also carries a suitable saddle 77 which supports the fin and pipe construction. This saddle is free to move longitudinally responsive to the expansion and contraction of the fin and pipe assembly so helps to eliminate noise in the system.

In the foregoing description and in the accompanying drawing, the preferred and various modified embodiments of baseboard radiators and elements thereof in accordance with the invention have been disclosed. It is, of course, to be understood that such disclosure is for illustrative and not limiting purposes, it being appreciated that one skilled in the art, upon considering such disclosure, might well devise variations or modifications thereof still falling within the spirit and scope of the invention. It is, accordingly intended that all matter shown in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In heating construction, in combination with the floor and wall of a space to be heated, baseboard radiator construction, said radiator construction comprising a substantially horizontally extending pipe formed of heat transmissive material, said pipe being carried by said wall, a multiple of fins in the form of separate sections of sheet material formed with openings therethrough substantially centrally thereof, said fins being mounted on

6

said pipe by means of said openings and being positioned in axially spaced relationship along said pipe, said fins having bottom edges inclined upwardly at an angle with respect to the horizontal, said pipe being mounted adjacent said floor and said wall and the corner of said fins at the lowermost portion of said inclined bottom edges being positioned closely adjacent said floor at a position closely adjacent said wall, said radiator construction having a rear cover member secured to said wall and having a bottom edge commencing substantially in line with said lowermost portion of said bottom edges of said fins and extending upwardly beyond the uppermost extent of said fins and turning inwardly in a top portion lying above and at least part way across said fins to terminate in a horizontally extending edge, and a front cover member for said pipe and fin assembly, said front cover member commencing at its lower edge substantially in line with the upper end of said inclined bottom edge of said fins and extending upwardly throughout the vertical height of said fins and terminating in a horizontal edge in spaced relationship with respect to said horizontally extending edge of said top portion to provide an outlet passage for heated air therebetween, the lower edge of said front cover member being spaced above said floor whereby cold air currents flowing across said floor may flow transversely across beneath said inclined bottom edges of said fins with the lower most coldest air engaging the lowermost portion of said fins to produce a substantially uniform flue effect of air being heated and caused to flow upwardly throughout the depth of said fins, said fins being spaced from said front and back cover members and each of said fins being formed with a body portion and a pair of side portions extending throughout the height of said fin along opposite sides thereof, the first of said side portions extending from said body portion at an obtuse angled bend and the second of said side portions extending from the first of said side portions at a right angled bend, to terminate in an end face substantially engaging the side portion of the next adjacent fin, the material of said side portions for a portion of the height thereof, at either side of, and inclusive of said right angled bend, being removed to form openings surrounded by the material of and extending through said fins for the flow of air therethrough.

2. In heating construction as in claim 1, said fins being of trapezoidal shape with the vertical back and front edges and with top edges inclining downwardly from said back to said front edge, whereby the coldest air entering the spaces between said fins at the lowest portions of said bottom edges will remain at heat exchange relationship longer than air entering at the upper portions of said bottom edges.

References Cited in the file of this patent

UNITED STATES PATENTS

1,863,056	Kuentler	June 14, 1932
1,873,052	Seward	Aug. 23, 1932
1,882,719	Armstrong et al.	Oct. 18, 1932
1,998,664	Erbach	Apr. 23, 1935
2,656,156	Wilcox	Oct. 20, 1953
2,876,631	Bailey	Mar. 10, 1959
2,899,178	Dubin et al.	Aug. 11, 1959