

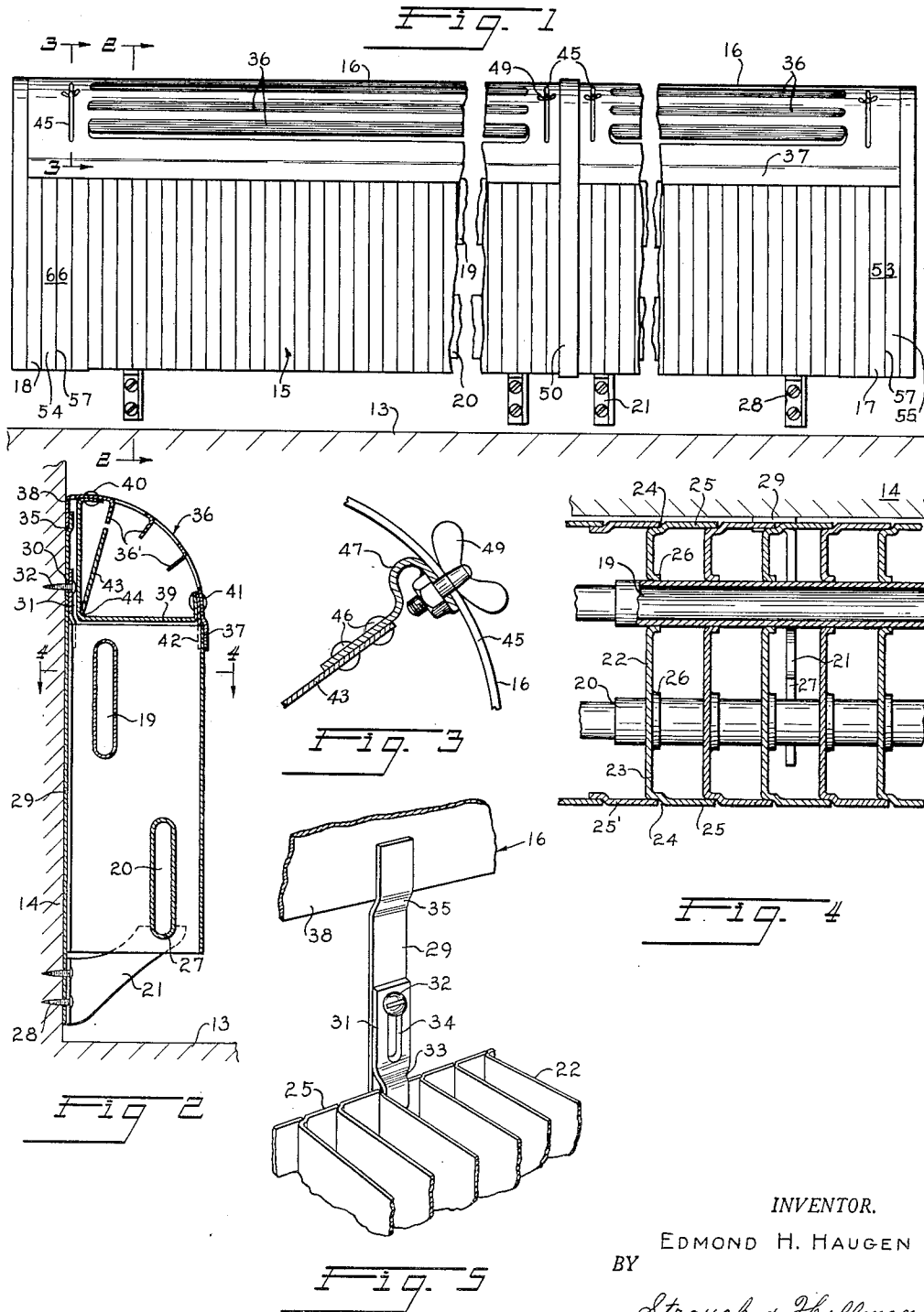
Aug. 1, 1950

E. H. HAUGEN
RADIATOR

2,516,871

Filed Nov. 8, 1944

2 Sheets-Sheet 1



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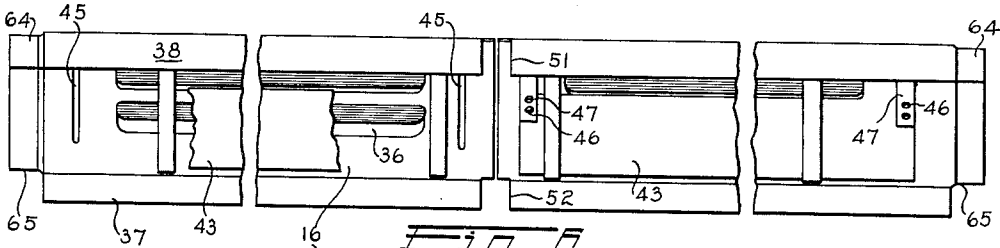
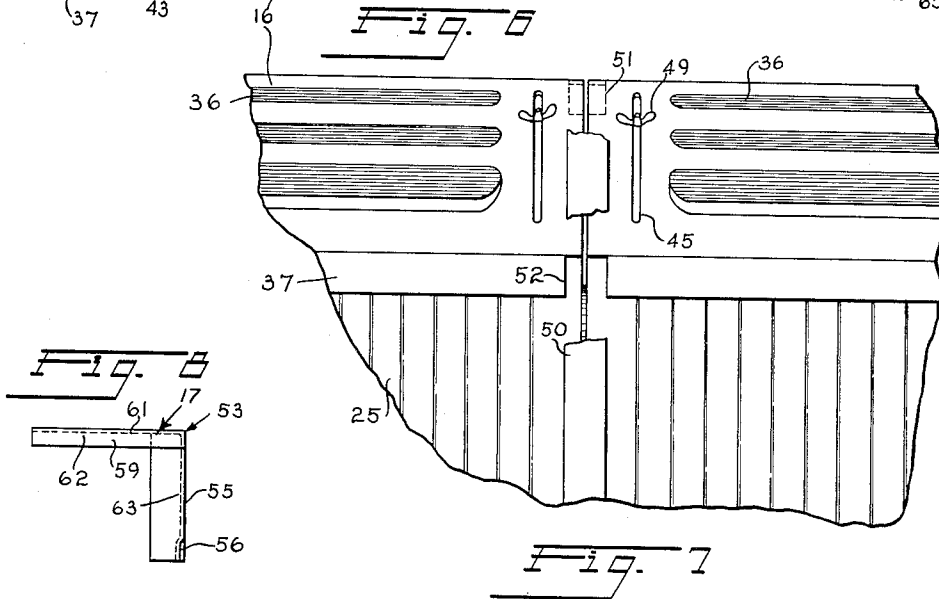
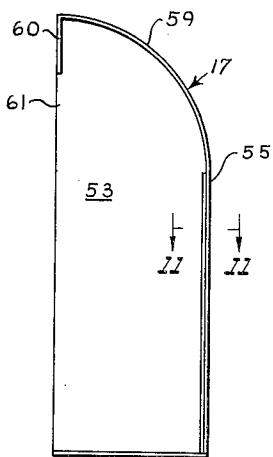


Fig. 9

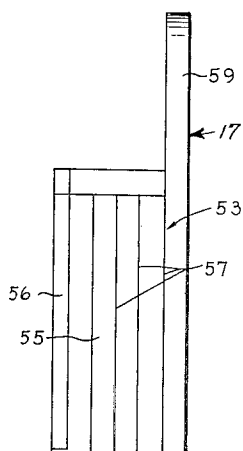


Fig. 10

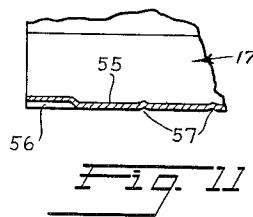


Fig. 11

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RADIATOR

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1 Claim. (Cl. 257—141)

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This invention relates to an improvement in radiators of the baseboard type adapted to approximately fit a space normally occupied by the baseboard of a wall and to the novel method of fabrication of same. More particularly, this invention relates to a radiator of low height and small thickness which is highly efficient and combines both radiant and convectional heating effects to fulfill the heating requirements of the room in which it is installed.

Baseboard radiators are known in the art as evidenced by Murray Patent No. 1,776,080, but are not commercially used for a number of reasons. The most important of these are their low thermal efficiency, caused by a number of factors, usually including the poor circulation of air and the too small area of contact between the circulating air and the heat transfer area, and inefficient heat conduction from the heating medium to the remainder of the heat transfer section.

It is, accordingly, a primary object of the present invention to provide a novel highly efficient radiator of the baseboard type that will function both as a radiant and a convection heater.

A further important object of this invention is to provide a novel radiator construction in which the tubes for conducting the heating medium are of narrow, lateral cross section and are displaced both vertically and laterally with respect to each other to induce adequate flow of circulating air.

A further object of this invention is to provide a novel heat transfer assembly comprised of multiple stampings or the like interfitted and welded, or otherwise secured together, to form multiple laterally enclosed passages to induce circulation of air, which, further provides an efficient radiant heating surface.

Still another object of this invention is to provide improved top cover and end cover plate arrangements for a radiator.

A further important object of this invention is the provision of novel adjustable vane arrangements for controlling the directional flow of heated air from a radiator.

A further object of the present invention is to provide improved means for mounting radiators of this type.

Still further objects of the invention will appear from the following description and appended claim in conjunction with the attached drawings wherein:

Figure 1 is a fragmental elevational view of a baseboard radiator made in accordance with the present invention, having cover and end plates,

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and broken away to show the heating medium tubes;

Figure 2 is a cross sectional view taken on the line 2—2 of Figure 1, looking in the direction of the arrows and illustrating especially the staggered heating fluid conducting tube arrangements;

Figure 3 is a cross sectional view taken substantially on the line 3—3 of Figure 1, looking in the direction of the arrows, showing the details of the vane adjustment assembly;

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 2, looking in the direction of the arrows and showing details of the radiator fin construction, the heating medium tubes, and the radiator support bracket;

Figure 5 is a fragmentary perspective view of the upper portion of the support bracket with its co-operating anchor clip;

Figure 6 is a rear elevational view (looking from the wall) of the top cover plate;

Figure 7 is a fragmental front elevational view of the assembly illustrating the details of the juncture of the top cover members;

Figure 8 is a front elevational view showing the details of the right hand end cover plate;

Figure 9 is a side elevation of the right hand end cover plate;

Figure 10 is a plan view of the right hand end cover plate; and

Figure 11 is a partial sectional view taken along the line 11—11 of Figure 9 showing the stepped vertical edge of the flue section co-operating with the right hand end cover plate.

With continued reference to the drawings, wherein like reference characters have been employed to represent like parts throughout the several views thereof, and more particularly to Figures 1 through 5, the reference numeral 13 designates in general a room floor, adjoined to a wall 14 on which the sectional radiator 15 of my invention is mounted. Radiator 15 is enclosed on the top, front and ends by top cover plates 16 for each section, a right hand end closure unit 17, and a left hand end closure unit 18. Heating elements 19 and 20, carrying a suitable heating medium, such as steam or hot water, run longitudinally through the radiator, which is supported by spaced brackets 21.

These heating elements 19 and 20, which are preferably of copper or other water resistant metal are constructed of flat tubing and are laterally and vertically displaced from each other in the assembly as shown in Figure 2. Tubes 19 and 20 are arranged with their longer flat sides

vertical and are parallel. Their lateral displacement insures a large turbulence of the upwardly moving air and their flat shape affords a maximum of hot surface to be wiped in heat exchange contact with the circulating air to be heated.

Attached normal to the tubes 19 and 20 is a plurality of thin radiator fins 22, preferably of copper or other like high heat-dissipating metal usually spaced equidistant from each other. Tubes 19 and 20 extend through suitable apertures in fins 22 and are supported thereby. At each extremity 23 of each of the fins 22, the metal is stepped doubly as at 24 and bent in vertical planes so as to provide front and rear vertical faces 25 which abut steps 24 of the adjacent fins. The fins 22 are perforated and flanged as at 26 for passage and attachment of the tubes 19 and 20. Rigid union between respective fins, and between the tubes 19, 20 and fins 22, is obtained by brazing, sweating or other suitable means. When fins 22, formed as described, are affixed to tubes 19 and 20, a radiator structure is provided wherein the fins define laterally enclosed air passages open at bottom and top for bringing air to be heated into close heat exchange contact with the hot tubes 19 and 20 and the large areas of fins 22 heated by conduction therefrom.

Each bracket 21 is grooved as at 27 to receive the lower end of tube 20, thus supporting the radiator assembly from beneath. Each bracket 21 is attached to the abutting room wall, as by screws 28, and has a narrow vertical strip 29 extending upwardly at the rear of the radiator body. This strip 29 is apertured at 30 to receive the screw 32 or some suitable means for holding an anchor clip 31 in place. Strip 29 is held flat against the wall by screws 28 and 32. This anchor clip 31 is stepped outwardly as at 33 to fit over the top of the adjacent flat rear fin face 25 of the radiator, and has a slot 34 to allow easy lifting of the clip and removal of the radiator upon loosening screws 32. Each strip 29 is itself stepped and flanged out at 35 to seat the rearward bottom portion of the top cover plate 16, as will be noted hereinafter. In this manner radiator 15 rests on brackets 21 and is releasably held in position by clips 31, which are accessible upon removal of top cover plate 16.

Each top cover plate 16 is formed quadrantly in cross section and has longitudinal louvers 36 stamped through it to provide a circulatory effect in the heated air rising from the radiator passages below. Each louver has a radially projecting inner flange 36'. The frontal part of each top cover plate 16 is stepped as at 37 (Figure 2) to extend over the front fin faces 25 of the radiator, and the rearward portion of cover 16 is flanged downwardly at 38 to fit frictionally behind flange 35 of the bracket strip 29, thus making a flush joint at the rear of the radiator. An internal angle bracket 39, attached to cover plate 16 as by rivets 40 and 41, stiffens the cover plate and provides a base for the deflector vane mentioned below. In addition, a reinforcing and clamping strip 42 is fastened between the bracket 39 and the flange 37 so that the adjacent radiator front flat 25 is firmly frictionally gripped between strip 42 and the flange 37. By this, and by the locking action of co-operating flanges 35 and 38, the cover plate is held firmly in place, but may be easily removed at any time.

A deflector vane 43 extending substantially throughout the length of each radiator section rests on the corner 44 of the bracket 39 and freely pivots thereon. The angularity of this vane is

adjustable by means of controls operating in slots 45 cut in the curvilinear surface of cover plate 16. Vane 43 is attached by rivets 46 to curved end brackets 47 to each of which is attached by lock nut 48 an external adjusting wing nut 49 seating on the edges of the adjacent slot 45. By this arrangement the convectional upward flow of heated air may be selectively directed to various of the several louvers by alignment with a selected flange 36' or outward at a specified angle, as may be desired.

The radiator body 15 and the cover plates 16 are manufactured in convenient section lengths suitable for jointure to fill a given linear space at the baseboard of a room wall. To effect this union during assembly, the abutting ends of the heating tubes 19 and 20 are joined by suitable fluid tight means such as a common enclosing sleeve (not shown) sweated, brazed, or otherwise attached to the adjoining tube ends while the adjacent fins of the juxtaposed sections of the radiators are joined together by filler plates 25' and fastened as are the individual fins above described. Filler plates 25' are shaped similarly to the vertical faces 25 of the fins and are affixed at opposite edges to the adjacent interfitting fins.

To conceal the space intervening between adjacent cover plates 16 and to present a more pleasing appearance, a narrow joint cover strip 50, formed so as to pass over the entire portion of the joint as viewed from the front, passing down over and bridging adjacent front flats 25 and suitably crimped at its extremities to fit over the rear of the cover plate 16 and the bottom of the radiator body 15, is supplied. The adjacent ends of top cover plate 16 are notched to provide a recess 51 to allow the strip 50 to lie flush against the room wall, coplanar with the flange 38. A recess 52 allows the strip 50 to become coplanar with the stepped flange 37 for like reasons. Thus viewed from the front, the radiator presents a substantially flat surface formed by flats 25, surmounted by cover 16.

To close the end of the radiator and to provide space for a suitable return bend or similar connection between the heating tubes 19 and 20, end cover plates 53 and 54 are supplied. Referring to Figures 1, and 8 through 11, the front vertical surface 55, which upon installation is coplanar with the flats 25, is stepped at its left hand edge as at 56 for purposes described below. The flat portion 55 has vertical grooves 57 stamped or pressed in it to ornamentally simulate the jointures of the fins of the radiator between plates 53 and 54, so as to present a uniform, pleasing appearance. The grooves 57 are terminated below upper edge 58, although the flat 55 continues in the same plane. The curvilinear portion 59 of the end plate 53 consists of a narrow strip having its end flanged over at 60 as shown. The end face 61 of the end plate is crimped under as at 62, and the front face 55 is similarly beaded as at 63. To provide a co-operating surface for the end plate 53, adjacent cover plate 16 is stepped as at 64 (Figure 6), similarly to step 56. This step extends over the entire curvilinear portion 59 and over the rearward flange 38. In addition, a step 65 is cut from the flange 37 as shown.

In assembly the end cover plate fits on as follows. The curved portion 59 fits over the step 64 and flange 60, and likewise fits over flange 38 of the cover plate 16. The edge 58 fits under flange 37 between it and clamping strip 42, in like manner to the radiator flats 25. This is possible since the cover plate 16 extends beyond the radiator

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5 fins proper for the width of the end plate 53. The stepped edge 56 fits under the flat 25 of the last fin in the radiator body, and the whole assembly is so designed and manufactured as to be sprung into place on assembly, thus insuring a snug, easily demountable fit.

The left hand end closure plate 54 is similar to plate 53, except that it is oppositely constructed so as to fit the other end of the radiator. However, its inner edge is not stepped as at 56, but is coplanar with the corresponding front surface 66, so as to fit over the step 24 of adjacent fin 22. In all other respects, the end plate 54 fits on in a similar manner to that of plate 53.

Suitable fittings may be provided for connecting tubes 19 and 20 to the steam or hot water supply and return pipes, as desired.

It will be seen from the foregoing description that I have invented a simple, sturdy, efficient radiator of novel construction, which can be assembled in any convenient length, by using the required number of sections, as desired. In addition, it is easily demountable for cleaning and repair without the use of special tools of any sort. The high heat transfer properties of the material used, plus the convectional action of the adjacent vertical passages working in conjunction with the louvers and deflecting vanes, guarantee a high heat output for a given amount of heating medium transmitted. The flat shape of the heating tubes is adapted for greatest efficiency, as such a design radiates more heat per unit of cross sectional area than a conventional circular tube, offers less resistance to the upward flow of heated air in the radiator, and holds the amount of heating medium temperature stratification to a minimum. Since installation will be near the floor where air currents are strongest, there will be a minimum "temperature zone" effect that might render room heating inefficient.

The number of radiator sections employed is predetermined by calculation of the heating requirements.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claim rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claim are therefore considered to be embraced therein.

The invention is not limited to the use of only two laterally offset heating tubes as illustrated, but may comprise a plurality of laterally offset tubes, for example as many as six or eight tubes arranged in staggered relation in separate horizontal layers.

What is claimed and desired to be secured by United States Letters Patent is:

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In an elongated box-like baseboard radiator, a pair of horizontally extending substantially parallel lengths of fluid conducting tubing mounted in vertically and laterally displaced relation, each of said lengths of tubing being relatively flat and narrow in cross-section and being disposed with their longer flat sides substantially vertical, a plurality of substantially rectangular fins secured to and arranged perpendicularly to said tubing length and spaced along said tubing and extending substantially from top to bottom of the body of said radiator for providing a plurality of individual generally vertical passages for movement of air to be heated past said tubing, said fins being sheet metal plates having their front and rear ends bent to form the front and rear walls of said vertical passages, and a longitudinally extending cover providing a longitudinal passage along the top of said radiator above said fins so connected with the upper ends of said fins that said vertical passages separately open into said longitudinal cover, said longitudinal passage being apertured for discharging heated air from said radiator along the length of said radiator.

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