Sept. 26, 1944. W. J. HARTWIG 2,358,973

UNIT HEATER

Filed Oct. 24, 1942 3 Sheets-Sheet 1

Fig. 2.

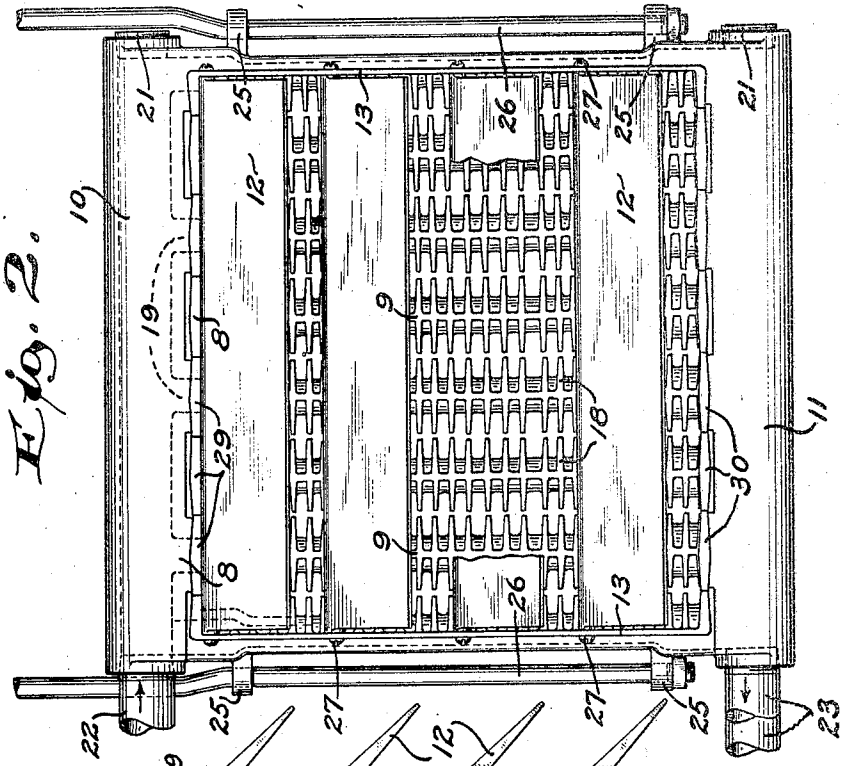
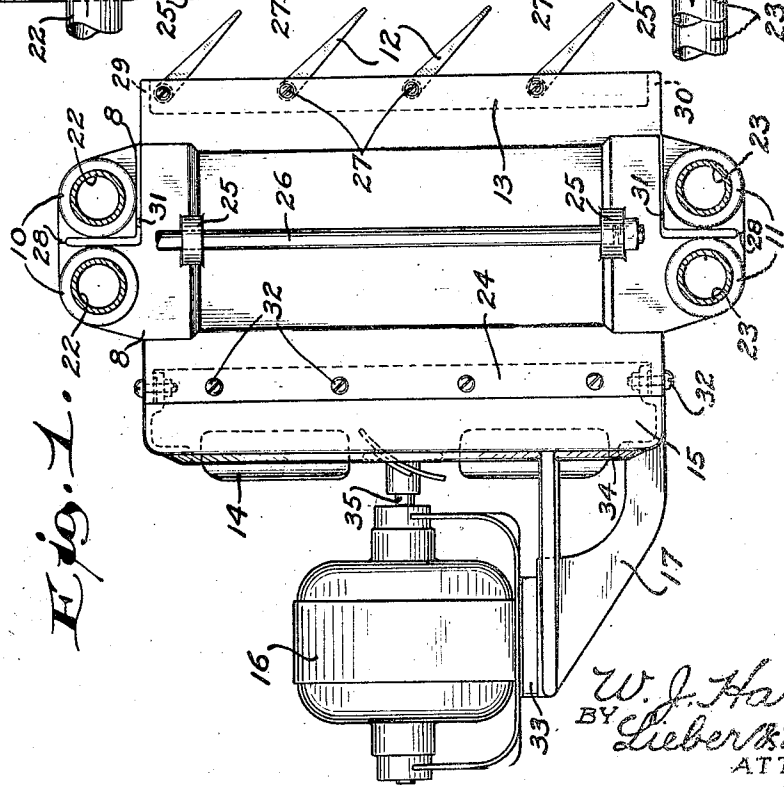


Fig. 1.



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Filed Oct. 24, 1942 3 Sheets-Sheet 2

Fig. 4.

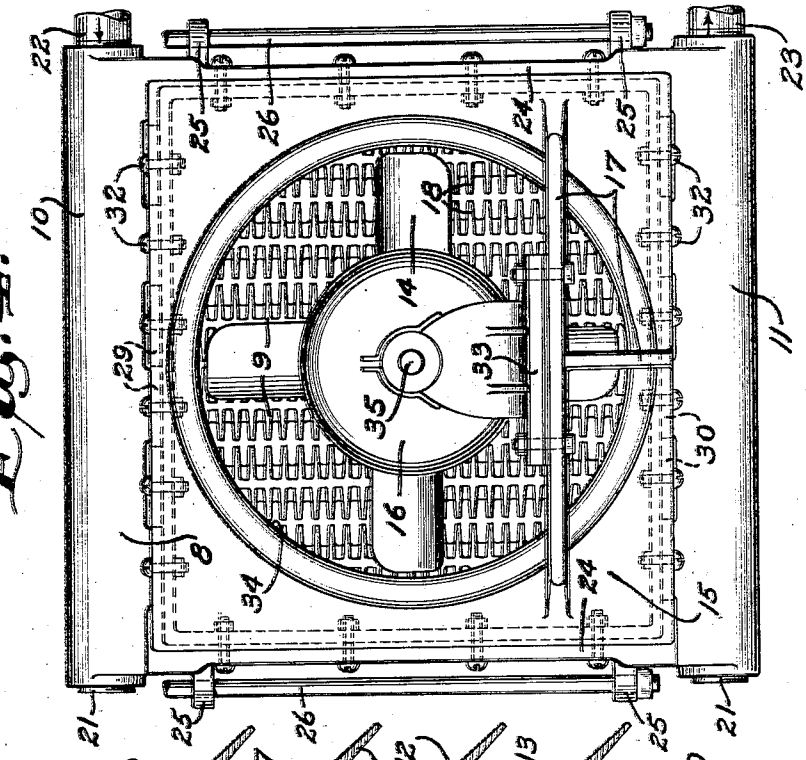
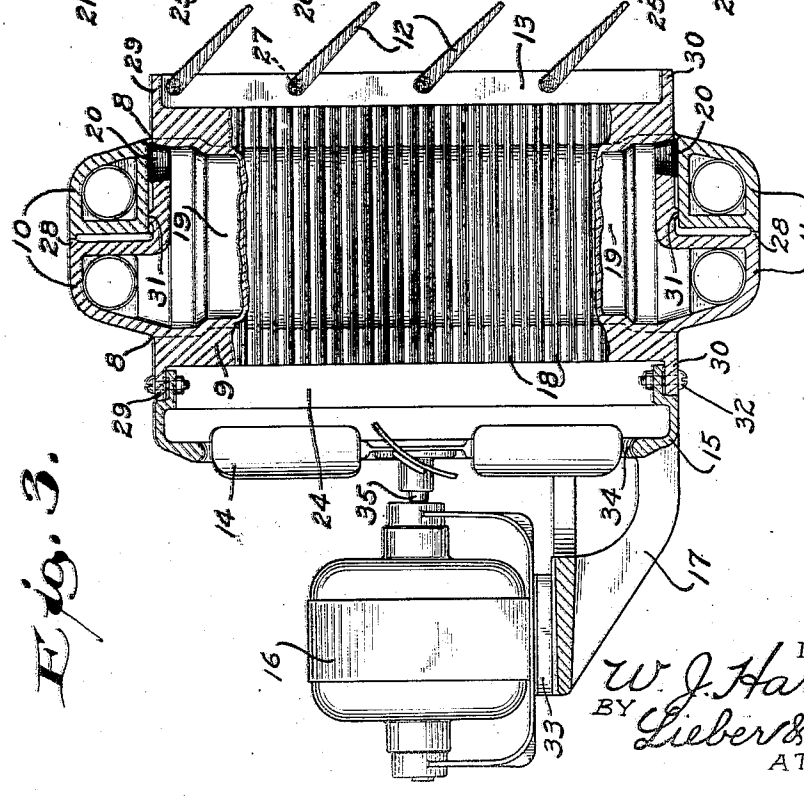


Fig. 3.



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UNIT HEATER

Filed Oct. 24, 1942 3 Sheets-Sheet 3

Fig. 6.

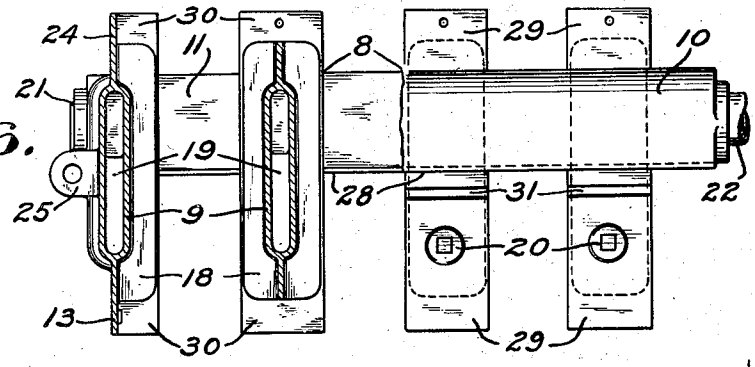


Fig. 5.

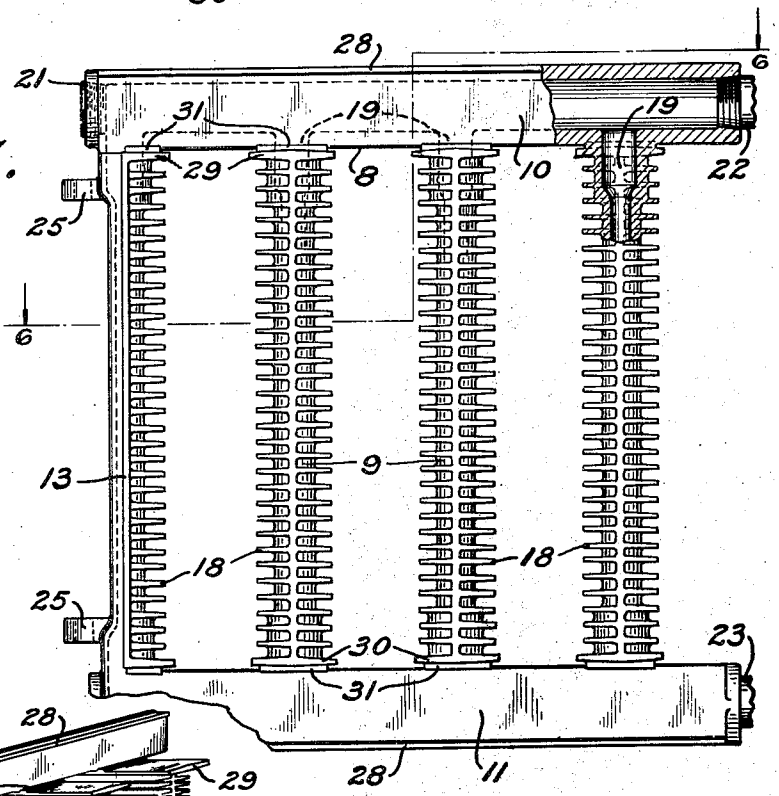
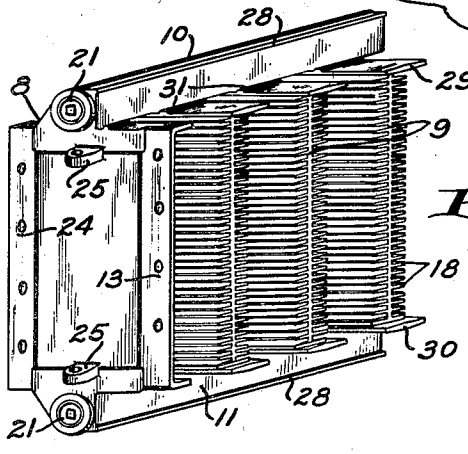


Fig. 7.



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UNITED STATES PATENT OFFICE

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UNIT HEATER

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Application October 24, 1942, Serial No. 463,187

5 Claims. (Cl. 257—137)

The present invention relates generally to improvements in the art of heat transfer, and relates more specifically to improvements in the construction and operation of so-called unit heaters and blast coils for normally imparting heat to a stream of air flowing in a predetermined direction.

A general object of my present invention is to provide a new and useful unit heater assemblage which is simple in construction and efficient in operation.

Numerous types of unit heaters for constantly imparting heat to a stream of air and for delivering the heated air in desired directions, have heretofore been in common use for diverse purposes, and most of these prior heating units embody a heat transfer coil or grid assembly, a fan or blower for causing the air to flow past the heat transfer assembly, and means for causing the heated air to flow in a predetermined direction. In the more efficient forms of these prior unit heaters, the coil assembly is constructed of a series of independent parallel finned radiator sections having their opposite ends detachably associated with heating fluid supply and discharge headers; and this grid assemblage is housed within a special outer casing or housing having a louvered or similarly controlled outlet opening and an alined air inlet opening provided with a motor driven fan which is in some manner suspended from the heat transfer assemblage. In practically all of the previous finned radiator assemblies it was necessary to cast or to otherwise produce the externally finned radiator sections independently of each other and of the headers, and to thereafter assemble the various parts with leak-proof joints, because of the fact that the fins must be disposed closely adjacent to each other in order to obtain maximum efficiency; and in some of the prior finned structures, the relatively frail and thin fins were formed of special relatively rare metal having high heat conductivity and were attached to the more bulky conduit portions of the radiator sections by casting or otherwise. It was therefore difficult and costly to construct and to assemble the prior heat transfer assemblages of this type so as to maintain leak-proof joints, and recent restrictions placed upon the use of certain materials have also precluded the use thereof for many purposes including the manufacture of unit heaters.

The present invention therefore contemplates various improvements in the details of construction of finned grid type unit heater assemblages, of simplified construction and adapted to be manufactured primarily of relatively inexpensive and available materials.

Another specific object of my present invention is to provide an improved unit heater comprising relatively few parts adapted to be produced by casting and with minimum machining, and wherein the heating fluid conducting conduits are devoid of joints which might introduce objectionable leakage.

A further specific object of this invention is to provide a durable and highly efficient finned heat transfer radiator having a plurality of finned sections formed integral with common heating fluid supply and discharge headers, and which can be readily constructed of cast iron or the like and at minimum cost with ordinary foundry equipment.

Still another specific object of the invention is to provide a compact heating unit having relatively few parts which may be readily assembled or dismantled, and wherein a continuous stream or current of air may be constantly heated and properly directed toward the zone of utilization.

An additional specific object of the present invention is to provide an attractive unit heater assemblage of the grid type which occupies minimum space considering its capacity, and which may also be readily suspended from above or mounted from substructure with the blower structure rigidly associated with the radiator and louver assemblies so as to produce a unitary assemblage.

These and other specific objects and advantages of the present improvement will be apparent from the following detailed description.

A clear conception of the various features constituting my present invention, and of the mode of constructing, assembling and operating one of the improved unit heaters, may be had by referring to the drawings accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the several views.

Fig. 1 is a side elevation of one of the improved unit heaters, completely assembled and adapted for overhead suspension, and ready for operation;

Fig. 2 is a front view of the same unit heater but with portions broken away to reveal normally concealed structure;

Fig. 3 is a vertical section through the assembled unit heater, showing the motor driven fan in elevation;

Fig. 4 is a rear view of the unit heater assemblage;

Fig. 5 is a part sectional front view of one of the finned radiator units comprising several sections and integral headers;

Fig. 6 is a transverse section through the finned radiator unit of Fig. 5, taken along the line 6—6; and

Fig. 7 is an isometric perspective view of the

finned assembly of Figs. 5 and 6, drawn to reduced scale.

Although the invention has been shown and described as being specifically embodied in a ceiling suspended unit heater having two radiator sections, a louver air control, and an electric motor driven fan suspended from the heat transfer sections, it is not my desire or intent to unnecessarily restrict the scope or utility of the improved features some of which may obviously be advantageously applied to other types of heaters such as blast coils and to unit coolers as well as heaters.

Referring to the drawings, my present improved unit heater comprises in general a pair of similar reversely positioned and inter-locking heat transfer elements 8 each having a plurality of parallel vertically disposed finned conduit sections 9 formed integral with a common upper heating fluid supply header 10 and with a common lower spent fluid discharge header 11; a series of horizontal pivotally suspended adjustable warm air flow control and directing louvers 12 swingably suspended from front side flanges 13 one of which is formed integral with each of the elements 8; an air impeller or fan 14 located rearwardly of the finned conduit sections 9 in horizontal alinement with the louvers 12 and cooperating with a rear casing 15 to direct a stream of air past the finned heat transfer sections 9; and an electric motor 16 drivingly associated with the fan 14 and being suspended from the casing 15 and the elements 8 by means of a support or bracket 17 formed integral with the rear casing 15.

The specific construction of the individual one-piece elements 8 is clearly shown in Figs. 5, 6 and 7, and each of these unitary elements may be readily constructed of any suitable and available metal such as cast iron, and by ordinary foundry methods, by virtue of the fact that the successive parallel finned conduit sections 9 of each element 8, are separated laterally by wide open spaces as indicated in Fig. 5. Each of the upright radiator sections 9 is provided with a plurality of parallel approximately rectangular fins 18 and with a relatively wide and narrow internal heating fluid conducting passage 19 as shown in Figs. 5 and 6; and since the finned sections 9 are formed integral with the supply and discharge headers 10, 11 and the passages 19 are in open communication with the headers adjoining the ends thereof, no joints or seals of any kind are required between the radiating sections 9 and the headers 10, 11. In order to facilitate supporting of the foundry cores for the wide passages 19, the opposite ends of the finned sections 9 may be provided with openings which may subsequently be sealed by pipe plugs 20; and the opposite ends of each of the horizontal headers 10, 11 are also provided with threaded openings one of which is normally sealed by a pipe plug 21 and the other of which is connected either to a heating fluid inlet pipe 22 or with a spent fluid outlet pipe 23. Besides the front side flange 13, each heating coil element 9 is also provided with a rear side flange 24 and with a set of side bosses 25 for receiving suspension bolts 26, and these bolts may be utilized to suspend the unit from above. The warm air flow control and directing louvers 12 are swingably suspended from the opposite side flanges 13 of the two coil sections in front of the elements 8, by means of friction pivots or screws 27, and may therefore be adjusted and disposed in any desired angular position.

In order to permit two of the similar heat transfer elements 8 to be assembled and interlocked as shown in Figs. 1 to 4 inclusive, the headers 10, 11 of the two heat transfer units are off-set rearwardly and forwardly so that the corresponding headers of the two elements 8 are disposed on opposite sides of the common central vertical plane passing through all of the finned sections 9; and the headers 10, 11 are provided with contact lugs 28 which extend throughout the lengths thereof and may be dressed to close the gap between the adjacent headers so as to prevent undesirable escape of warm air therebetween. The upper and lower heavy fins or local flanges 29, 30 respectively of the sections 9 are also preferably made heavier and longer than the intermediate fins 18 so that when the two elements 8 are assembled, these longer local flanges 29, 30 will form top and bottom closure walls for the air duct and will also cooperate with the rear side flanges 24 to provide means for attaching the fan casing 15. The stout upper and lower flanges 29, 30 may also be provided with transverse lugs 31 which are adapted to be dressed so as to coact with and to properly position the headers 10, 11 of the complementary heat transfer elements 8, so that the adjacent fins 18 and flanges 29, 30 will all be properly alined in the final assemblage.

The fan casing 15 and the fan motor supporting bracket 17 may be formed integral with each other, and this integral assemblage may be firmly attached to the rear ends of the upper and lower flanges 29, 30 and to the rear side flanges 24 by means of rivets or bolts 32, as shown in Figs. 3 and 4, thereby also locking the two radiator elements 8 in assembled position. The suspension bracket 17 may be provided with an insulating pad 33 or the like, upon which the electric motor 16 may be mounted in any desired manner, and the rotary fan 14 which is revolvable in a circular central opening 34 formed in the casing 15 in horizontal alinement with the finned sections 9, is mounted directly upon the motor shaft 35. In order to permit most efficient operation and flexibility in use, it is preferable to have the motor 16 operable at several speeds, and the supply or inlet pipes 22 may be provided with either independent or a common control valve so that either one or both elements 8 may be supplied with heating medium, or the heating fluid may be shut off entirely.

When the several elements 8, louvers 12 and casing 15 of the improved unit heater have been properly constructed by ordinary foundry methods, they may be dressed so as to properly coact with each other by merely grinding or filing rough areas and by drilling holes for the reception of the screws 27, 32, whereupon they may be quickly assembled as illustrated in Figs. 1 to 4 inclusive. Since the two elements 8 are interchangeably similar, they may be molded and cast from the same pattern, and each element 8 may be provided with any desired number of finned sections 9. The motor driven fan 14 may be of relatively standard construction, and after the motor 16 has been mounted upon the bracket 17 with the fan 14 disposed centrally of the circular opening 34, and suspension bolts 26 have been applied to the lugs 25, the unit heater may be suspended from overhead structure. The headers 10, 11 may finally be connected to the heating fluid supply and exhaust pipes 22, 23, and these pipes may be attached to either end of the headers, or a single pipe may serve both of the supply headers 10 and another single pipe may

likewise serve both exhaust headers in series, by merely connecting the corresponding ends of each set of headers with a reverse bend and nipples in a well known manner.

When the heat transfer unit has been thus constructed, assembled and mounted, the louvers 12 should be adjusted so as to direct the warm air in the proper direction and heating fluid should be admitted to the finned coil elements 8, whereupon operation of the fan 14 will cause a continuous stream or current of air to be blown through the coils in contact with the radiating fins 18. The air will thus be quickly and uniformly heated, and the warm air will pass through the spaces between the louvers 12 and will be caused to flow in the desired direction into the space which is to be heated. The rate of flow may be varied by altering the speed of the motor 16, and the direction of flow of the warm air stream may be varied by adjusting the louvers 12, while the temperature of the heated air may be varied by controlling the heating fluid supply with the aid of ordinary control valves, thus providing a unit heater which is highly flexible in use.

From the foregoing detailed description it will be apparent that my present invention provides a new and useful unit heater assemblage which is extremely simple and compact in construction, highly efficient in operation, and which may be readily manufactured at minimum cost from available materials. By forming the heat transfer assemblage of interchangeably similar unitary elements 8 which are adapted to be reversely disposed and united as described, these elements 8 may be readily cast and dressed with minimum effort, and the use of separate outer housings or casings is eliminated. The integral construction of the finned elements 8 moreover introduces great strength and provides a compact and highly attractive unit having maximum capacity considering the space occupied. This unitary construction of the finned sections 9 and headers 10, 11 also avoids the use of gaskets and joints thereby eliminating possible leakage or escape of heating medium; and the improved mounting for the flow producing fan or blower assemblage besides providing a firm support for the fan, serves the additional function of maintaining the two elements 8 firmly interconnected. The improved unit heaters can be manufactured and sold in various sizes at minimum cost, and may be provided either with overhead suspension means such as shown, or otherwise mounted.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of use, herein shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. In combination, a pair of similar reversely assembled heat transfer elements having parallel laterally spaced heat transfer conduits and each having a side wall disposed parallel to said conduits and extending away from one of its end conduits and also having local flanges extending in the same direction outwardly away from the opposite end portions of each of its conduits in the same direction as the said side walls, said side walls and flanges cooperating to provide an air duct directed toward the spaces between said conduits, a fan for directing air through said duct, and a fan support attached to said walls and flanges and thereby uniting said elements.

2. In combination, a pair of similar reversely assembled heat transfer elements having parallel laterally spaced heat transfer conduits and each having local flanges extending in the same direction outwardly away from the opposite end portions of each of its conduits, said flanges cooperating with each other and with the opposite side conduits in the assemblage to provide an air duct directed toward the spaces between said conduits, a fan for directing air through said duct, and a fan casing defining a circular opening at one end of said duct within which said fan is rotatable and being secured to said flanges to rigidly unite said elements.

3. In combination, a pair of similar reversely assembled heat transfer elements each having parallel laterally spaced heat transfer conduits connected to transverse upper and lower end headers, and each also having a side wall extending away from one of its end conduits and local flanges extending in the same direction as the side wall away from each of its headers, said side walls and flanges cooperating to provide an air duct directed through the spaces between said conduits and the upper and lower headers of the two sections being disposed side by side above and below said duct in the final assemblage, a fan for producing a flow of air through said duct, and a support for said fan attached to said walls and flanges and uniting said elements.

4. In combination, a pair of interchangeably similar reversely assembled heat transfer elements each having several upright laterally spaced heat transfer conduits connected to transverse upper and lower end headers disposed on the same side of the common central plane of the conduits, and each also having a side wall extending away from one of its end conduits and local flanges extending in the same direction as the side wall away from each of its headers, said side walls and flanges cooperating to provide an air duct directed through the spaces between the two sections and the upper and lower headers of the two sections coacting with each other above and below said duct in the final assemblage, a fan for producing a flow of air through said duct, and a fan casing at one end of said duct within which said fan is rotatable and being secured to said flanges to rigidly unite said elements.

5. In combination, a pair of interchangeably similar reversely assembled heat transfer elements each having several parallel laterally spaced heat transfer conduits connected to transverse upper and lower end headers disposed on the same side of the common central plane of all of the conduits, and each also having a side wall extending away from one of its end conduits and local flanges extending in the same direction as the side wall away from each of its headers, said side walls and flanges cooperating to provide an air duct directed through the spaces between said conduits and the upper and lower headers of the two sections coacting with each other along said central plane in the final assemblage, a fan for producing a flow of air through said duct, and a support for said fan attached to said walls and flanges and uniting said elements.

WALTER J. HARTWIG.