March 7, 1944. J. W. SARGENT ET AL 2,343,387

HEAT TRANSFER UNIT

Filed June 29, 1942 2 Sheets-Sheet 1

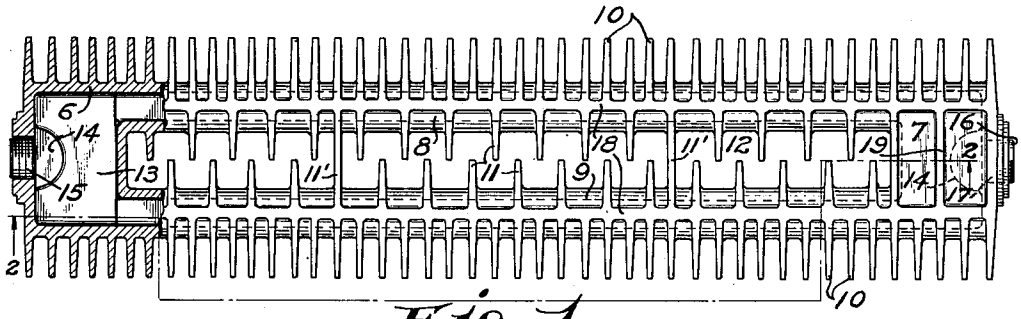

Fig. 1.

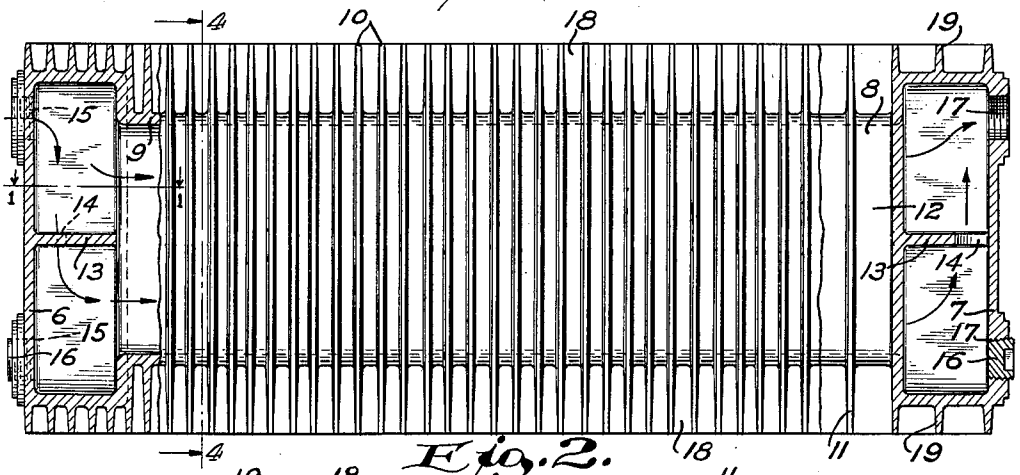

Fig. 2.

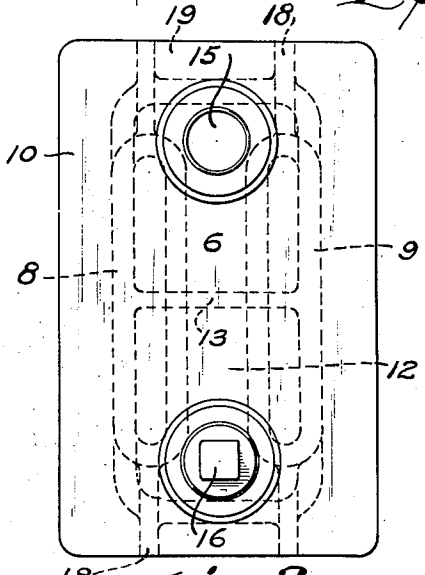

Fig. 3.

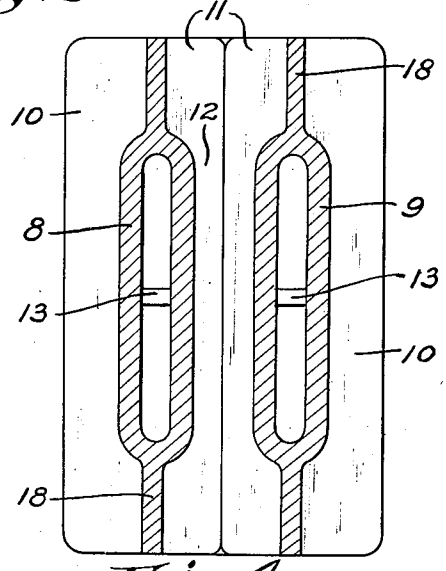

Fig. 4.

INVENTORS.
J. W. Sargent
C. E. Staky
BY
Lieber & Lieber ATTORNEYS.

March 7, 1944. J. W. SARGENT ET AL 2,343,387

HEAT TRANSFER UNIT

Filed June 29, 1942 2 Sheets-Sheet 2

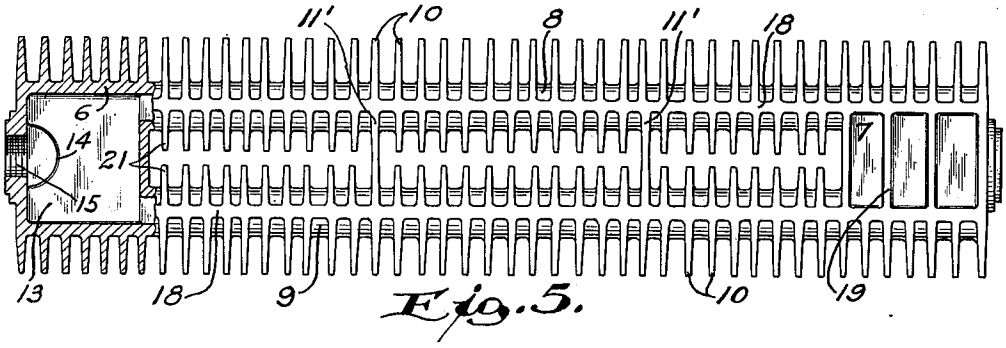

Fig. 5.

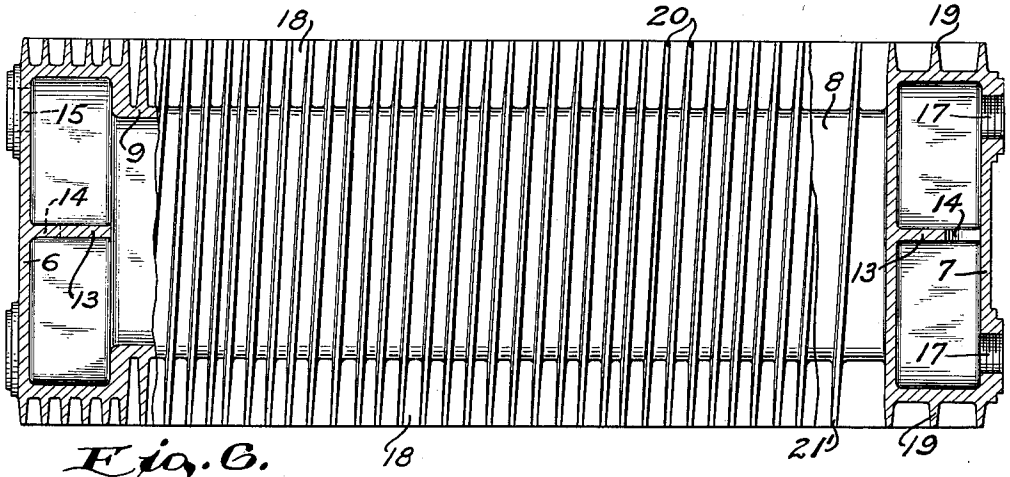

Fig. 6.

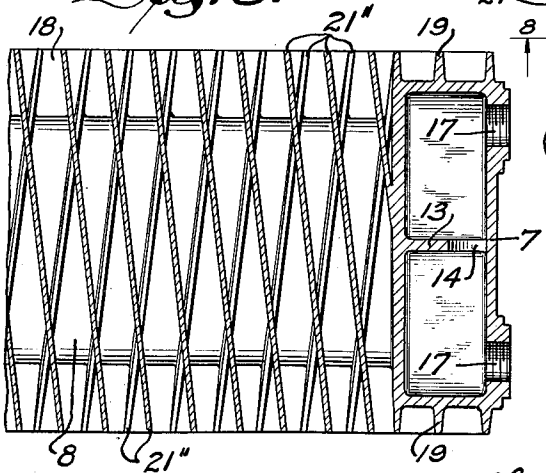

Fig. 8.

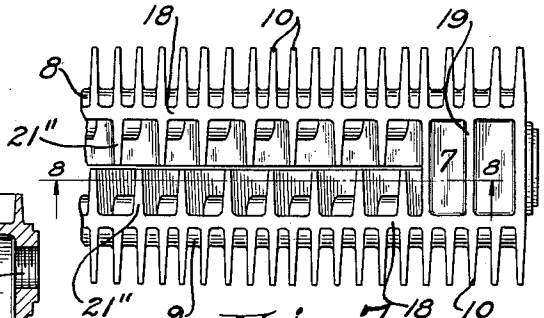

Fig. 7.

INVENTORS
J. W. Sargent
BY C. E. Staky
Lieber & Lieber ATTORNEYS.

Patented Mar. 7, 1944 2,343,387

UNITED STATES PATENT OFFICE

2,343,387

HEAT TRANSFER UNIT

John W. Sargent and Carl E. Staky, Wausau, Wis., assignors to D. J. Murray Manufacturing Co., Wausau, Wis., a corporation of Wisconsin

Application June 29, 1942, Serial No. 448,904

4 Claims. (Cl. 257—150)

The present invention relates in general to improvements in the art of heat transfer, and relates more specifically to improvements in the construction and operation of heat transfer units or sections adapted for diverse uses.

The primary object of our invention is to provide an improved heat transfer unit of the finned type, which is simple in construction and highly efficient in use.

It has heretofore been common practice to utilize finned heat transfer units or sections of the general type shown in Bassler Patent No. 1,840,651, granted January 12, 1932, either singly or in multiple, for various purposes; and while these patented units are entirely satisfactory and have proven highly successful, the general use of aluminum or metals other than cast iron in the formation of the fins, is prohibitive at present. Because of the size, number, and relatively thin nature of the fins required to provide the necessary radiation in heat transfer equipment of this kind, it is not an easy matter to construct these radiating sections entirely of cast iron without introducing considerable loss in efficiency, and the curtailment to the use of aluminum and aluminum alloys has therefore introduced many rather difficult problems in the manufacture of such finned heat transfer devices.

It is therefore a more specific object of our invention to provide various improvements in the mode of constructing finned heat transfer sections or units, whereby such devices may be manufactured of readily available metals such as cast iron without undesirable loss in the efficiency thereof.

Another specific object of this invention is to provide an improved cast metal heat radiating unit which can be readily produced from a single casting to provide a durable and highly efficient heat transfer element.

A further specific object of the present invention is to provide a new and useful multi-finned heat transfer device which may be constructed entirely of relatively inexpensive material such as cast iron, and in an expeditious manner.

Still another specific object of the invention is to provide an improved heat transfer unit having a multiplicity of relatively thin fins projecting considerable distances from the body thereof, and so disposed that they will provide maximum radiation while permitting relatively convenient manufacture thereof.

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

A clear conception of the several features constituting the present improvement, and of the mode of constructing and of utilizing finned heat transfer units made in accordance with the invention, 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 various views.

Fig. 1 is a part sectional top view of one of our improved heat transfer units, the section through one end thereof having been taken along the line 1—1 of Fig. 2;

Fig. 2 is a part sectional side elevation of the heat transfer unit of Fig. 1, the sections through the opposite ends thereof having been taken along the irregular line 2—2 of Fig. 1;

Fig. 3 is a somewhat enlarged full end view of the improved heat transfer unit of Figs. 1 and 2;

Fig. 4 is a transverse vertical section through the improved heat transfer unit taken along the line 4—4 of Fig. 2;

Fig. 5 is a part sectional top view similar to that of Fig. 1, and showing a modified heat transfer unit;

Fig. 6 is a part sectional side elevation similar to that of Fig. 2, and depicting another modified heat transfer unit embodying our invention;

Fig. 7 is a fragmentary top view of a further modified type of our improved heat transfer unit; and

Fig. 8 is a fragmentary longitudinal section through the modification of Fig. 7, taken along the line 8—8.

While the invention has been shown and described herein as having been specifically embodied in one-piece finned heat transfer units formed of cast iron and especially adapted to be used in multiple with other similar units as in unit heaters, it is not our desire or intent to thereby unnecessarily restrict the scope or utility of the improvement, and it will be understood that the improved units may also be advantageously used individually, and that they may be disposed in any desired position.

Referring to Figs. 1 to 4 of the drawings, the improved one-piece cast-metal heat transfer device or unit shown therein, comprises in general a one-piece body or casing having opposite end sections or chambers 6, 7 interconnected by a pair of relatively flat and elongated laterally spaced fluid conducting sections or chambers 8, 9; a series of closely adjacent parallel outer fins 10 formed integral with and projecting out-

wardly away from each of the elongated chambers 8, 9; and another series of more remotely separated parallel inner fins 11 formed integral with each elongated chamber 8, 9 and projecting partially across the space 12 between these chambers, the inner fins of one chamber being staggered relative to those of the other.

The end chambers 6, 7 may be somewhat higher than the intermediate chambers 8, 9, and these end chambers may also be provided with internal re-enforcing partitions 13 each having one or more through openings 14 therein; and the inlet end chamber 6 is provided with two inlet openings 15 one of which may be sealed by a pipe plug 16, while the outlet end chamber 7 is provided with two outlet openings 17 of which one may likewise be sealed by a pipe plug 16. All of the fins 10, 11 are preferably slightly tapered toward their outermost edges in order to provide proper draft for production thereof by molding and casting, and while most of the inner fins 11 only partially span the space 12, some of these fins 11' may be extended entirely across this space so as to re-enforce the medial portions of the casing chambers 8, 9. The elongated chambers 8, 9 may also be additionally re-enforced and prevented from warping, by means of integral ribs 18 extending throughout the length of the unit and having their outer edges disposed flush with the adjacent edges of the fins 10, 11; and the end chambers 6, 7 may be of any desired length and also have stiffening and radiating ribs 19.

Referring especially to Fig. 5, the improved heat transfer unit shown therein is quite similar in construction to that of Figs. 1 to 4, inclusive, but the inner fins 21 of the modified unit are not so remotely spaced and are not staggered. In this modification, the inner fins 21 are of the same number as the outer fins 10, and do not extend quite as far into the space 12 as in Fig. 1, in order to facilitate coring between these closely adjacent fins 21. The end chambers 6, 7 of the modified structure are also somewhat larger than those of Fig. 1, but in both Fig. 1 and Fig. 5 all of the fins 10, 11, 21 are disposed in planes which are approximately perpendicular to the central longitudinal plane of the units passing centrally through the chambers 8, 9.

Referring more particularly to Fig. 6, the improved modified heat transfer unit depicted therein is also quite similar to that of Figs. 1 to 4, inclusive, except that the outer fins 20 and the inner more remotely separated and fewer fins 21' are disposed in planes which are inclined relative to the central longitudinal plane of the unit passing centrally through the chambers 8, 9. This inclined disposition of the fins somewhat retards the free flow of air past the chambers 8, 9, and also facilititates directing the heated air in a desired direction when the transfer units are assembled or applied to unit heaters or the like.

Referring to Figs. 7 and 8, the improved further modified heat transfer unit illustrated therein is again quite similar to that of Figs. 1 to 4, inclusive, differing therefrom in that the inner fins 21'' of the two chambers 8, 9 are oppositely inclined relative to the planes of the outer fins 10. This construction provides an effective baffle for somewhat retarding the free flow of air through the space 12, while permitting remote spacing of the fins 21'' in order to facilitate casting of these units.

All of the improved heat transfer units may be readily manufactured by molding and casting operations, and all of them are substantially rectangular prismatic in external shape, thus permitting close nesting or grouping of the units as in unit heater assemblages. During normal use, the improved heat transfer devices may be used either independently, in series, or in parallel grouped relationship, and the pipe plugs 16 may be applied to either set of openings 15, 17, or they may be entirely omitted. When the units have been properly connected to the heating medium supply and exhaust sources, and have been assembled into desirable groups, heating medium such as steam may be admitted through the inlet opening or openings 15 of each unit and will flow through the openings 14 and through the elongated chambers 8, 9, being eventually discharged through the outlet opening or openings 17. During such passage of the steam through the finned unit, the fins 10, 11, 20, 21 and the ribs 18, 19 as well as the intervening portions of the casings 6, 7, 8, 9, will radiate heat to the ambient atmosphere. It is to be noted that the fluid inlet pipe or supply header may be connected to either or both of the inlet openings 15, and that the outlet pipe or discharge header may likewise be applied to either or both of the outlet openings 17, and the improved units may also be disposed in any desired position.

From the foregoing detailed description it will be apparent that our present invention provides an improved heat transfer unit which is simple, compact and durable in construction and which is moreover highly efficient in use. The new heat transfer device can be readily manufactured in the form of a single unitary casting, by ordinary foundry methods, and may therefore be constructed of metals which are most readily available. The improved heat transfer element is also highly flexible in use by virtue of the fact that it can be used individually or in any desired grouped arrangement, and also because the inlet and outlet openings may be used interchangeably at the will of the operator. The improved fin construction while being extremely efficient in effecting desired heat radiation, may also be readily manufactured without danger of producing imperfect castings, and the entire assemblage is very strong and is not subject to objectionable warpage or deformation. Heat transfer units constructed in accordance with the present invention have proven highly successful and efficient, and may be produced in quantity at moderate cost and without utilizing aluminum or other special materials in their formation. The modified fin structures of Figs. 5, 7 and 8 are adapted to effect more uniform heat transfer by baffling the flow of air through the space 12, and the inclined disposition of the fins 20, 21' of Fig. 6 is also advantageous in causing the heated air to flow in the desired direction as in radiators and unit heaters.

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.

We claim:

1. A heat transfer unit comprising, a one-piece cast-metal body having laterally spaced parallel elongated chambers communicating at their corresponding opposite ends with end chambers each of which spans the adjacent end of the space

between said elongated chambers and is divided into two parts by a transverse partition extending longitudinally of the unit, each of said end chamber parts having an opening communicating with the extreme outer end thereof, parallel outer fins projecting outwardly away from the outer surfaces of said chambers, parallel inner fins extending away from said elongated chambers and into the space therebetween, and other inner fins spanning said space and rigidly uniting said elongated chambers at local places.

2. A heat transfer unit comprising, a one-piece cast-metal body having laterally spaced parallel elongated chambers communicating at their corresponding opposite ends with end chambers each of which spans the adjacent end of the space between said elongated chambers and is divided into two parts by a transverse partition extending longitudinally of the unit, each of said end chamber parts having an opening communicating with the extreme outer end thereof, closely adjacent parallel outer fins projecting outwardly away from the outer surfaces of said chambers, more remotely spaced parallel inner fins extending away from said elongated chambers and into the space therebetween, and other inner fins spanning said space and rigidly uniting said elongated chambers at local places.

3. A heat transfer unit comprising, a one-piece cast-metal body having laterally spaced parallel relatively high but narrow elongated chambers communicating at their corresponding opposite ends with end chambers each of which spans the adjacent end of a relatively high but narrow open space between said elongated chambers and is divided into upper and lower parts by a transverse medial partition extending longitudinally of the unit, each of said end chamber parts having a threaded opening communicating with the extreme outer end thereof, parallel outer fins projecting outwardly away from the outer surfaces of all of said chambers, parallel inner fins extending away from each of said elongated chambers toward the other and into said space, and other inner fins completely spanning said space and integrally uniting said elongated chambers at local places.

4. A heat transfer unit comprising, a one-piece cast-metal body having laterally spaced parallel relatively high but narrow elongated chambers communicating at their corresponding opposite ends with end chambers each of which spans the adjacent end of a relatively high but narrow open space between said elongated chambers and is divided into upper and lower parts by a transverse medial partition extending longitudinally of the unit, each of said end chamber parts having a threaded opening communicating with the extreme outer end thereof, closely adjacent parallel outer fins projecting outwardly away from the outer surfaces of all of said chambers, more remotely spaced parallel inner fins extending away from each of said elongated chambers and into said space, and other inner fins completely spanning said space and integrally uniting said elongated chambers at local places.

JOHN W. SARGENT.
CARL E. STAKY.